DOCUMENT RESUME

ED 146 371 08 CE 013 195

AUTHOR	Ammerman, Harry L.
TITLE	Performance Content for Job Training. Volume 3. Identifying Relevant Job Performance. Research and Development Series No. 123.
INSTITUTION	Ohio State Univ., Columbus. Center for Vocational Education.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C. Education and Work Group.
PUB DATE	Mar 77
CONTRACT	NE-C-00-3-0078
NOTE	90p.; For related documents see CE 013 193-197
AVAILABLE FROM	Center for Vocational Education Publications, Ohio State University, 1960 Kenny Road, Columbus, Ohio (RD 123, $6.25; Set RD 121-125, with case, $23.50)
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Curriculum Development; *Data Processing; Design; Guides; *Job Skills; Job Training; Labor Market; *Occupational Surveys; Performance Criteria; Post Secondary Education; *Questionnaires; Secondary Education; Systems Approach; *Task Performance; *Test Construction; Testing; Test Results; Vocational Education

ABSTRACT

This volume is the third of five volumes describing a systematic approach for constructing task inventories, surveying the task performance of occupations, and analyzing survey data to determine the appropriate performance content for job training. (The approach, referred to as the task survey process, is designed to be of value to both occupational curriculum personnel and those persons concerned with noncurriculum issues of occupational description and updating of job content information.) This volume, through an explicit set of procedural steps, describes the design, administration, and analysis of questionnaire surveys of occupational performance (surveys which describe the extent to which task activities are part of the job expectancies of workers in a particular occupation or function). Four activities (presented in separate sections) are included: planning survey design and analysis, administering questionnaire to worker and supervisors, processing survey data, and reporting the survey results. (SH)

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ED146371

Research and Development Series No. 123

PERFORMANCE CONTENT FOR JOB TRAINING

VOLUME 3

IDENTIFYING RELEVANT JOB PERFORMANCE

Harry L. Ammerman

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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1960 Kenny Road
Columbus, Ohio 43210

March 1977

CE 013 195

An Interim Report on a Project Conducted
Under Contract No. NE-C-00-3-0078

The material in this publication was prepared pursuant to a contract with the Education and Work Group of the National Institute of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under government sponsorship are encouraged to freely express their judgment in professional and technical matters. Points of view or opinions do not, therefore, necessarily represent official National Institute of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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FOREWORD TO VOLUME 3

The Center for Vocational Education is continuing programmatic research to develop more effective procedures for identifying valid and necessary curriculum content. One product of this effort is the five-volume description of procedures for constructing task inventories, surveying the task performance of occupations, and analyzing survey data to aid curriculum planners and developers in determining the appropriate performance content for job training. The procedures are intended to be of value to both occupational curriculum personnel and those persons concerned with noncurriculum issues of occupational description and updating of job content information.

This set of procedures revises and considerably expands upon an earlier version of task inventory and survey procedures in The Center's report authored by William Melching and Sidney Borcher, R&D Series No. 91, *Procedures for constructing and using task inventories,* March 1973. The initial procedures profited greatly and drew heavily from the report by Joseph Morsh and Wayne Archer at the USAF Personnel Research Laboratory, *Procedural guide for conducting occupational surveys in the United States Air Force.* Center development of the inventory and survey process has concentrated on their adaptation to purposes of helping in the derivation of curriculum content. This adaptation has included greater concern for how a task is stated, what task information should be obtained, and how to use this task information in selecting the more relevant and critical content that warrants consideration as a learning objective.

The total set of volumes in this series consists of the following titles:

Volume 1: Introduction.

Volume 2: Stating the tasks of the job.

Volume 3: Identifying relevant job performance.

Volume 4: Deriving performance requirements for training.

Volume 5: Processing survey data: Technical appendices.

This focus upon the performance content of specific occupations is parallel to The Center's concern for the *conceptual* and *affective* content of training, as published in earlier reports, R&D Series No. 98 and 105. Results of several research applications of portions of the process as it was being developed are published as R&D Series No. 86, 87, 88, 108, 109, and 110. Currently underway is an exploratory study of more generally applicable skills that may be used in different occupational areas as well as within a particular occupation. Such occupationally transferable skills or competencies would seem to be useful complements to the present concern for job-specific content.

Volume 3, Identifying Relevant Job Performance, guides the reader through an explicit set of procedural steps, assuming that a comprehensive list of potential tasks already exists and is available for use. The volume describes the design, administration, and analysis of questionnaire surveys of

occupational performance. The purpose of this stage of the process is to produce a description of the extent to which task activities are part of the job expectancies of workers in a particular occupation or function, or to differentiate between job types within an occupational area.

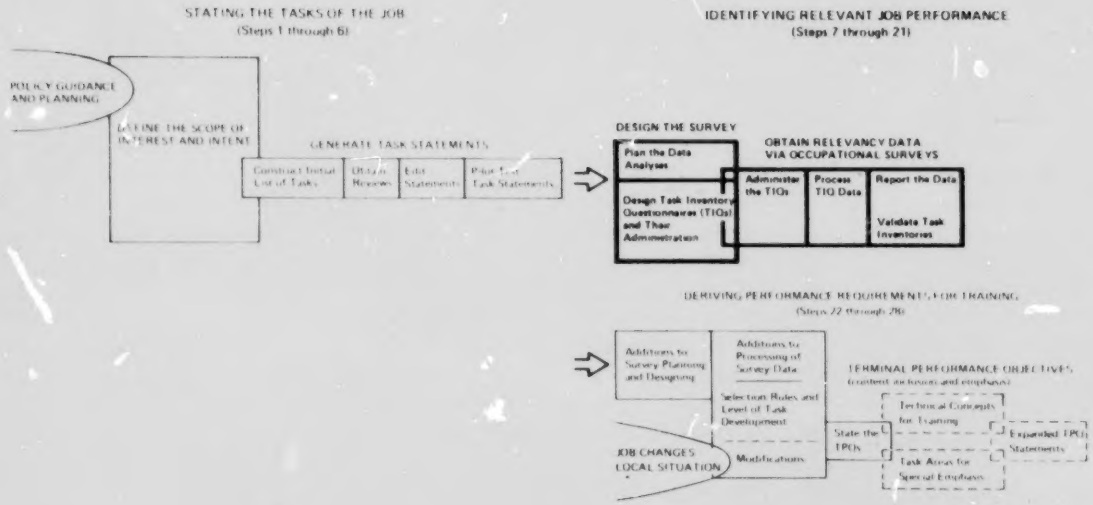
The procedures benefit from a variety of reported research studies and experiences of many persons over the last several years, notably that work sponsored and conducted by the USAF Personnel Research Laboratory. There also has been extensive input from the many vocational educators, curriculum developers, occupational instructors, employers, job supervisors, and workers themselves who have been involved in various aspects of trying out different portions of the process reported here.

This volume especially benefited from field tryouts of the original *Procedures for constructing and using task inventories* by several agencies and individuals. These tryouts were coordinated by Earl Russell and Connie Warren, and involved the participation of eight state curriculum laboratories within V-TECS (the Vocational-Technical Education Consortium of States) in the development of 19 task inventories. Additional tryouts were conducted by a local school district in Colorado. One university professor of vocational education used the original report as a supplemental text. Several vocational education graduate students at The Ohio State University also employed the reported procedures in their dissertation research. The cooperation of these participants and the useful feedback of their experiences with that report are very much appreciated. Within the project staff, Frank Pratzner, Duane Essex, David Gilmore, and Earl Russell contributed substantially to the development and tryout of the occupational survey procedures. Dr. Pratzner was director of the R&D program in which the five volumes of this set were developed. The work of which this volume is a part was sponsored by the Education and Work Group of the National Institute of Education, with Robert Stump serving as Project Officer.

Continued improvement can be anticipated as wider experience is gained in the implementation of task inventories and occupational surveys. It is hoped the present procedural descriptions may be of immediate use and value in aiding and promoting such implementation. By such means there should be increasing assurance that curriculums and instructional materials provide for those things most appropriately learned in a training program, and that students will be learning skills which are important to and required for effective job performance.

Robert E. Taylor
Executive Director
Center for Vocational Education

THE FOCUS OF VOLUME 3


STATING THE TASKS OF THE JOB
(Steps 1 through 6)
IDENTIFYING RELEVANT JOB PERFORMANCE
(Steps 7 through 21)
POLICY GUIDANCE AND PLANNING
DEFINE THE SCOPE OF INTEREST AND INTENT
GENERATE TASK STATEMENTS
DESIGN THE SURVEY
Plan the Data Analyses
Design Task Inventory Questionnaires (TIQs) and Their Administration
OBTAIN RELEVANCY DATA VIA OCCUPATIONAL SURVEYS
Administer the TIQs
Process TIQ Data
Report the Data
Validate Task Inventories
DERIVING PERFORMANCE REQUIREMENTS FOR TRAINING
(Steps 22 through 28)
Additions to Survey Planning and Designing
Additions to Processing of Survey Data
Selection Rules and Level of Task Development
Modifications
JOB CHANGES LOCAL SITUATION
TERMINAL PERFORMANCE OBJECTIVES
Technical Concepts for Training
Task Areas for Special Emphasis
Expanded TPOs Statements

Given that a complete and acceptable list of potential tasks is available (per directions given in Volume 2), the next effort is to conduct an *occupational survey of task performance.* Such a survey is intended to obtain *specific information about the job performance of each task* from many people directly knowledgeable about work being performed in the occupations being studied.

Volume 3 conveys procedures and guidelines for developing task questionnaires that may be used to identify how relevant each task is to a particular occupation. Job relevancy information serves primarily to describe and differentiate the occupations within the scope of interest. For purposes of developing or verifying the curriculum content of job training programs, this information helps identify what work activities are likely parts of the job. However, not all possible tasks warrant consideration in training programs. Expanded survey procedures are described in Volume 4 to provide additional information about each task to help in deciding which relevant tasks should be trained, and what features of a task should be the focus of the training content. The basic process of gathering relevance data is presented in Volume 3, to be of separate value to those users who may wish only to describe the performance content of occupations. Users wishing to select critical job content for curriculum purposes must follow both Volumes 3 and 4 together.

There are four major activities to follow in conducting occupational surveys. First there is the design of the survey, including both the advance planning of the intended data analyses and the

designing of survey questionnaires that will yield task data in a form that will accommodate such analyses. The other three major activities pertain to the process of obtaining data on task relevancy from persons close to and knowledgeable of the actual performance situations. Using survey instruments called Task Inventory Questionnaires (TIQ), the three major activities involve (a) administering the TIQs to selected types of respondents, (b) processing responses given to the TIQs, and (c) reporting results to others. Figure 1 depicts the sequence and component steps of these activities. Procedural steps are consecutively numbered to follow the first six steps described in Volume 2.

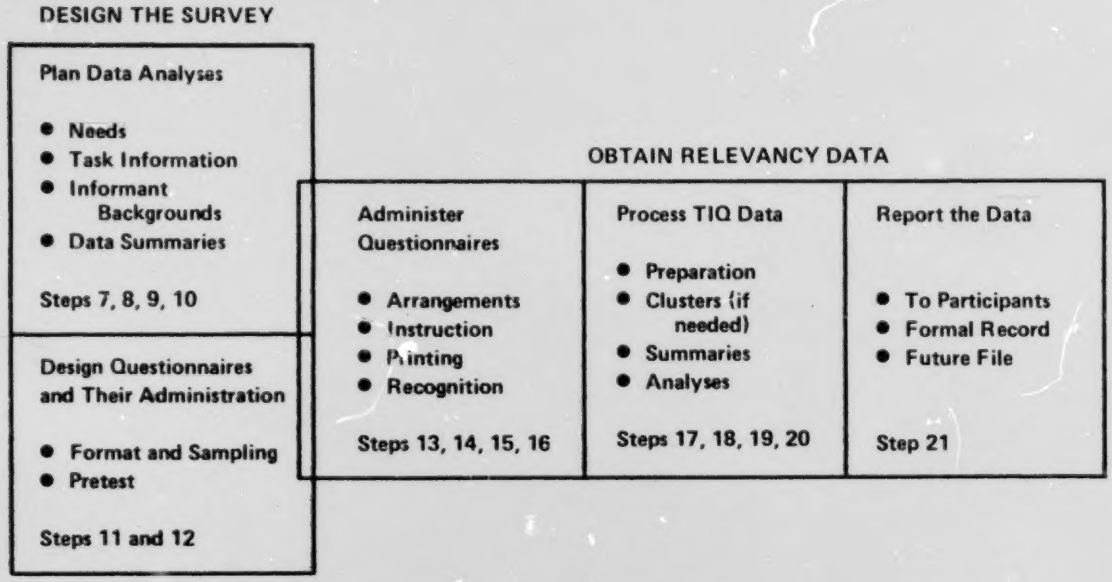


Figure 1. Procedural steps described in Volume 3.

The activities and procedural steps described in Volume 3 are intended to provide a timely and representative base of current task performance data, serving to validate each task as it pertains to the separate occupations defined (in Step 1) as of interest. Such validation in turn may be used to describe the composite of work performed in an occupation or for subgroups of workers.

Relevancy of tasks to an occupation is variable. Some tasks are more relevant than others, their degree of relevance being a measure of occupational validity. Several kinds of information (as noted later in Step 8) can be of use in identifying how job relevant is each task. The present procedures for assessing relevancy rely primarily upon the percent of workers performing a task and the extent to which that task is judged to be a part of the job of workers in the occupation. The measurement issue regarding job relevance is not whether or not a task is relevant, but to what degree it appears as part of representative work assignments. Thus, any one task may be relevant to several related occupations, but in differing degrees. Or, a task may be highly relevant for new workers, but nearly nonrelevant for very experienced senior workers. Such distinctions can serve to differentiate between related occupations or between particular subgroups of workers within an occupation.

This capacity to distinguish between different groupings of job assignments is called upon in Step 18. Using various statistical techniques it is possible to use task relevancy data to identify

clusters of highly similar work. That is, job positions in which workers tend to perform the same tasks (and these tasks have similar patterns of significance to those workers) would fall into one cluster. Another set of job positions that do somewhat different tasks (and where the significance patterns of any tasks common to the first cluster are also different) would fall into a second job cluster.

Analyzing jobs into clusters of similar work is most helpful when studying an occupational area where the distinctions between occupations are somewhat fuzzy and uncertain, or when studying an occupation that is still evolving and undergoing change. Failure to distinguish between job types can result in misleading validation of tasks, with relevancy information being summed across a heterogeneous mixture of job positions such that any summaries may not accurately portray what tasks are relevant to any actual job or occupation.

Where the occupations can be well defined in advance, or where clearly only one occupation is to be studied, then the survey process becomes much less complex. It simply involves the following actions:

Given (a) the definition of the scope of occupational training interest and (b) the comprehensive list of potential tasks performed by workers within the scope defined.
(in accordance with Steps 1-6 of Volume 2)

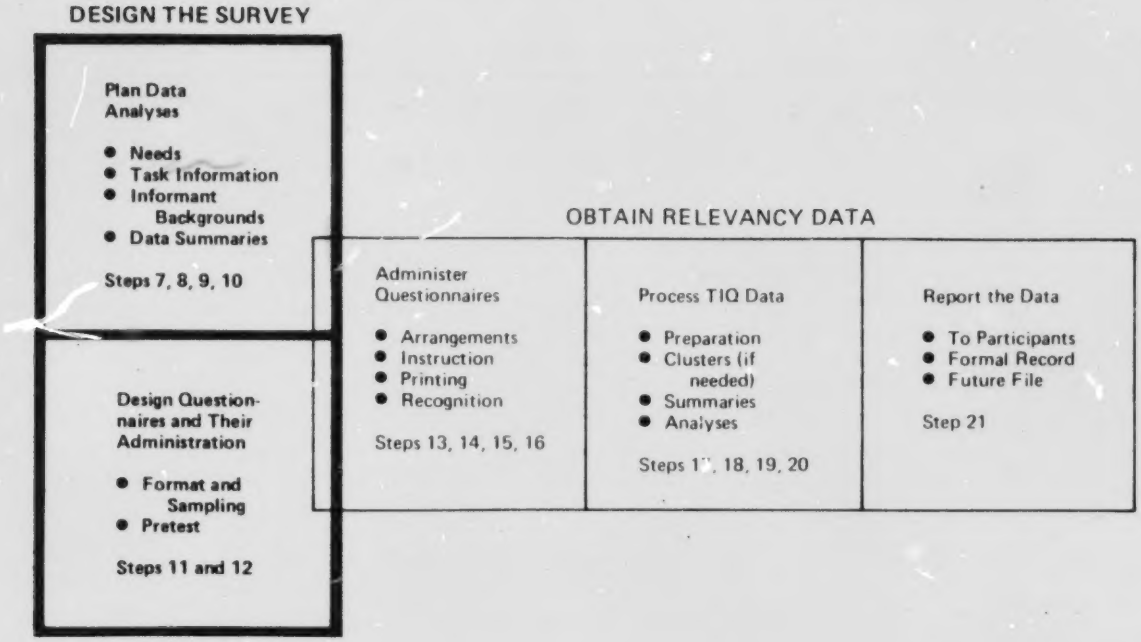
Then

- Select the questions to be asked about each task to provide desired descriptive data on task relevance.
- Design a sampling plan to obtain representative task data (that is, decide how many and what types of persons are needed to answer the survey).
- Pretest the survey instructions or any new question formats.
- Make arrangements for having the survey questionnaires administered to the types of persons that are wanted.
- Print and distribute the task survey questionnaires to selected respondents.
- Prepare the returned questionnaire data for computer processing.
- Compute descriptive summaries of responses to each task. Do this separately for each defined job type or for particular subgroups of persons answering the questionnaire.
- Perform desired analyses of the data summaries, such as comparisons between occupations or subgroups, or a ranking of tasks on their degree of relevancy to one occupation.
- Prepare reports of the survey and analysis results.

These nine actions correspond generally to Steps 7 through 21 as described in this volume, with the exception that Step 18 (Clustering) is unnecessary when the occupations surveyed are already well defined. Descriptions of procedures and guidelines for accomplishing this process are given in detail in this volume.

Several options are discussed, to accommodate a variety of special situations that may arise or of special studies that may be desired. It is hoped that such detail may be of help when doing surveys for the first time or when particular problems are encountered. However, do not lose sight of the fact that the occupational surveys are really a very straightforward process of administering questionnaires to a group of knowledgeable persons. When the bounds of the occupations to be studied are unclear, then the job clustering of Step 18 should be used to identify the differential work performed in component job types. It then becomes possible to summarize the questionnaire data to describe the relevance of each task to each identified job type or occupation.

ACTIVITY D: PLANNING SURVEY DESIGN AND ANALYSIS



Given the availability of an edited and pilot tested list of potential tasks for an occupation or area, and before obtaining field data on the occupational relevance of each listed task, there is a need to plan the intended survey: its design and appropriate analyses. This advance planning is the focus of Activity D. There are six procedural steps to be performed in carrying out this planning activity:

- Step 7: Determine What Results Are to Be Sought
- Step 8: Determine What Task Information Is Needed
- Step 9: Determine What Respondent Information Is Needed
- Step 10: Determine What Data Summaries and Analyses Are Needed
- Step 11: Design Survey and Its Administration
- Step 12: Pretest Questionnaire Instructions and Format

Each of these steps is described in the sections which follow.

STEP 7: DETERMINE WHAT RESULTS ARE TO BE SOUGHT

The defined scope of interest, provided by Step 1, now serves as a starting point for deciding what information or descriptions are desired. It is necessary in Step 7 to clarify fully what results are wanted from the occupational survey and subsequent analyses. Such clarification will help assure that the survey will gather the type of data needed and in a form that will be useful.

Job relevancy data can be used for several purposes, particularly to provide descriptions of:

- Work activities performed in a single occupation, serving to define and validate the performance characteristics of that occupation.
- Differences in work performance as a function of job location, type of industry, length of job experience of the workers, job specialties within the occupation, source of training, or other background characteristics of the persons answering the survey questionnaire or of the employment setting.
- Comparisons of similarities and differences of the work performed in two or more occupations.
- Trends, over time, of changes occurring in the work performance characteristics of an occupation.
- Occupational clusters existing within an occupational area.
- Clusters of job specialties existing within an occupation, or which are evolving.
- Comparison of job performance requirements as viewed by different types of persons (for example, workers versus immediate supervisors, workers versus training personnel).

Establishing what data summaries and analyses are necessary to achieve the desired information or conclusions will help in deciding (in Steps 8 and 9) what task and respondent information should be gathered by the survey. As appropriate, procedures given in Steps 8 and 9 will note special requirements for particular types of intended analyses and descriptions.

STEP 8: DETERMINE WHAT TASK INFORMATION IS NEEDED

Concern for task information involves both *what questions* to ask about each task and *what type of person* is to provide answers to each task question. It is recommended that at least two different types of persons answer task questions to provide bases for measuring the job relevancy of each task. These two types usually should consist of workers and of supervisors for each occupation, with workers reporting on the activities they actually perform, and supervisors reporting a composite of what they expect representative workers to do in their operation. Agreement by both types that a task is of very low or no relevance to a specified occupation serves to identify tasks which can be considered as "nonrelevant."

By the two-group process, from their differing perspectives of the occupation, the likelihood is increased that conclusions about task relevancy will be reasonably sensitive to the work activities actually performed and also sensitive to broader perspectives of what is intended and expected in the near future. For example, few workers in the secretarial field might be expected to indicate current performance of tasks associated with word processing systems, whereas supervisors might be aware of forthcoming installation of such systems or of comparable new technologies expected soon to be impacting upon the occupation. If only current worker activity were used as the basis of measuring relevancy, there could be a danger of considering as nonrelevant those tasks just beginning to emerge as part of the occupation. And, conversely, tasks beginning a trend toward obsolescence could at the moment of measurement be judged unduly high in relevance to the job.

An exception to the two-group process is necessary when the survey data are to be used to identify distinct job types represented within a pool of workers answering a survey questionnaire. To apply the statistical clustering routines for such identifications (Step 18), usually only the responses of persons telling what they themselves do are used to derive clusters of comparable job positions. Additionally, only one question asked about each task is used in the statistical computations.

Subsequent to the identification of each of the job types, it then becomes reasonable to apply the two-group process for establishing the relevancy of each task to a particular type of job. Supervisor ratings need to be obtained separately for each specified occupation or job type.

> If it is felt that the defined job types (Step 1) are adequate for the needs of a particular study, Step 18 clustering may be omitted. If not adequate, clustering must be accomplished before it is possible to administer questionnaires to persons other than workers describing their own job.

Task questions for describing job relevance. Questions regarding the "occurrence" and the "significance" of tasks are used to measure job relevancy. Each may be asked of immediate supervisors as well as of the workers actually doing the job, creating in effect four specific questions:

1. *Actual Task Occurrence* (asked of workers)

   During the last year or so, which of the listed tasks have you performed?

2. *Desired Task Occurrence* (asked of immediate supervisors)

   Which of the listed tasks should be performed by such workers in your operation (or office, firm, shop, garage, etc.)?

3. *Extent Task Is Part of the Position*[1] (asked of workers)

   How significant a part of your job is each listed task?

4. *Extent Task Is Part of the Job*[1] (asked of immediate supervisors)

   How significant a part of the job of such workers in your operation is each listed task?

Instructions and response scales for each of these four task questions are illustrated in Step 11. Questions 3 and 4 are an adaptation of a scale proposed originally by Hemphill (1960) for the study of the activities of business executives. All of these questions tend to provide highly reliable group data.

Some other task questions that have been used at various times by others to describe job relevance and task performance are noted in the Appendix. If any such additional descriptive task information is desired, it can usually be added to the survey questionnaires using Questions 1, 2, 3, or 4. Generally, no more than one additional question should be asked of any one respondent, so that no individual needs to answer more than two task questions.

Additional questions for use in selecting tasks for training. Information about the job relevance of each task is certainly one important ingredient for deciding which tasks need initial or preemployment training. Tasks performed by a majority of workers in the first few years of employment are common candidates for inclusion in formal training programs. Training for tasks performed by relatively few workers (say, less than 20 or 30%) is typically considered as not cost-effective for school-based preemployment programs.

Additional task information is needed, however, to specify more precisely which relevant tasks warrant school training, and to what level of development. Questions to support such decisions are presented in Volume 4. These questions would be administered concurrently with relevance questions when such task data are desired.

Options for questionnaire types when surveying a single occupation. It can generally be anticipated that one of three conditions will exist with regard to the availability and knowledge of persons close to the intended performance situation:

Condition I — Relatively many experienced and knowledgeable workers exist, and there are proportionately fewer immediate supervisors available or directly knowledgeable of the occupation.

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[1] For those readers familiar with the previous occupational survey reports of Center R&D Series No. 108, 109, and 110, Question 3 here is identical to Question 6 in the reports. Question 4 was not in the reports, but is an adaptation of the prior Question 6. Some 12 task questions were included in these earlier studies. Only selected ones of these are recommended in the various types of questionnaires in Volume 3, and a couple others are mentioned in Volume 4. The technical grounds for the selection of task questions is offered in Volume 5.

Condition II – Relatively few experienced and knowledgeable workers exist, but there are relatively many supervisors available who are directly knowledgeable of the occupation (such as when there is a very low worker-to-supervisor ratio, as may occur in small shops and offices).

Condition III – A newly evolving occupation with few experienced and knowledgeable workers existing, or other situations where most "workers" are not anticipated to be very knowledgeable of the occupation. This could occur for some selected life performance situation where segments of the public might operate as the "workers," and key individuals in the communities (or subject matter specialists) serve as the "supervisors" for the purpose of survey responses.

Under Condition I either of two survey types can be used, if only relevance data are desired:

- Type A, using Question 3 (Extent Task Is Part of the Position) with workers and Question 2 (Desired Task Occurrence) with immediate supervisors.
- Type B, using Question 1 (Actual Task Occurrence) with one group of workers, Question 3 (Extent Task Is Part of the Position) with a comparable second group of workers, and Question 2 (Desired Task Occurrence) with immediate supervisors.

These survey types, Types A and B, are the preferred versions for most conditions that will be commonly encountered, though additional types are cited below for use in special circumstances. Type B permits additional verification of task relevancy, useful when sufficient numbers of workers are available to survey two separate groups. This type also collects directly comparable data from both workers and supervisors, making it possible to detect wide differences between worker performance and supervisor expectations. A survey type using only Questions 1 and 2 is not recommended since, for about the same amount of administration effort, it is possible to obtain additional usable task information by also asking Question 3.

Also under Condition I, when it is desired only to survey workers, a third type can be of use:

- Type C, using Question 1 (Actual Task Occurrence) with one group of workers and Question 3 (Extent Task Is Part of the Position) with a comparable second group of workers.

An occasion for use of this type of questionnaire might occur when a professional or labor association wishes to survey its membership to determine the extent to which they perform tasks of the discipline or craft. Analyses could then be accomplished on the basis of different background characteristics of those responding, such as experienced workers versus inexperienced workers.

Under Conditions II and III either of two other survey types can be used:

- Type D, using Question 1 (Actual Task Performance) with workers, Question 2 (Desired Task Occurrence) with one group of immediate supervisors, and Question 4 (Extent Task Is Part of the Job) with a comparable second group of supervisors.
- Type E, using Question 1 (Actual Task Performance) with workers and Question 4 (Extent Task Is Part of the Job) with immediate supervisors.

These five questionnaire types are summarized in Figure 2, along with an indication of when each might be used, depending on the anticipated availability and knowledge of worker and supervisor groups.

Options for questionnaire types when also identifying job clusters. To provide the task data needed in Step 18 for applying statistical clustering routines, several additional survey types may be used. These usually should be used, however, only when very large numbers of workers are available to be surveyed. Though some statistical clustering procedures for small groups (less than 200) are noted in Step 18, these would be less preferred than those which handle large numbers of respondents (such as on the order of 2,000 persons).

- Type F, using Question 3 (Extent Task Is Part of the Position) with workers throughout the occupational area.

- Type G, using Question 3 (Extent Task Is Part of the Position) with workers and, after clustering, Question 2 (Desired Task Occurrence) with supervisors of each identified job cluster.

Another task question has been found useful in a number of occupational studies conducted by the Occupational and Manpower Research Division (AFHRL) and the Occupational Measurement Center (ATC) of the U.S. Air Force. It is particularly effective for identifying clusters of job types if one has access to their CODAP (Comprehensive Occupational Data Analysis Programs) computer program system that was developed to analyze and report occupational information collected with task inventories (Christal, 1974). The grouping program within CODAP makes use of data provided by the question to compute the overlap of each pair of workers responding, this in turn serving as the basis for extracting clusters or groups of similar work performance patterns. This additional task question is:

5. *Relative Time Spent* (asked of workers)

   Compared with all other tasks you do in your job, how much time do you spend doing each one of the listed tasks?

Though this question is not part of the procedures generally recommended in Volume 3, it is cited for possible use when there is a need and capacity for clustering occupations by means of the CODAP grouping program. Further mention of the processing of data obtained by this question is noted under Step 18, Clustering of Respondents into Job Types. Step 11, Design Survey and Administration, illustrates a typical questionnaire format for Question 5 used along with Question 1.

When it is desired to use the CODAP clustering programs for identifying job clusters, Question 5 (Relative Time Spent) may be added to Question 1 (Actual Task Occurrence) on survey Types C and E, or used with only one large group of workers. This produces Types H, I, and J.

Figure 3 summarizes these five questionnaire types for gathering clustering data along with task relevance information.

Selecting the kinds of survey respondents wanted. The general rule for selecting the kind of persons desired for answering task survey questions is to *select those who are closest to and immediately knowledgeable of the actual work activities being performed.* Most typically this will be

Summary of Questionnaire Types for Surveying Task Relevance:

Condition	Questionnaire Type	Workers		Supervisors	
		Group 1	Group 2	Group 1	Group 2
I	A	Question 3		Question 2	
I	B	Question 1	Question 3	Question 2	
I	C	Question 1	Question 3		
II	D	Question 1		Question 2	Question 4
III	E	Question 1		Question 4	

Recommended Options for Different Levels of Available Respondents:

Availability of Workers	Availability of Supervisors	
	Many, and Knowledgeable	Few, or Limited Knowledge
Very Many, and Experienced	Types A, B, D, or E	Type C
Many, and Experienced	Type B Preferred, or Type A	Type B Preferred, or Type A
Relatively Few, but Experienced	Type A Preferred, or Type D	Type A
Few Experienced, Most Not Very Knowledgeable of Job Scope	Type D Preferred, or Type E	Type E

Figure 2. Summary of questionnaire options for surveying task relevance in a defined occupation.

Clustering Plus Relevance Questionnaire Types:

Type	Situation	Workers	Supervisors
F	Clustering within an Area, Many Workers	Question 3	
G	Clustering within an Area, Supervisor Confirmation Desired	Question 3	Question 2 (after clustering)

CODAP Clustering Plus Relevance Questionnaire Types:

Type	Situation	Workers		Supervisors
		Group 1	Group 2	
H	Clusters and Relevance, No Supervisor Confirmation of Relevance	Questions 1 and 5	Question 3 (after clustering)	
I	Clusters, Followed by Supervisor Confirmation of Relevance	Questions 1 and 5		Question 4 (after clustering)
J	Desire Clusters Only	Questions 1 and 5		

Figure 3. Summary of questionnaire options for use in clustering jobs in an occupational area.

the workers in that occupation and/or immediate supervisors of such workers. Only rarely under special circumstances should these respondents be instructors in occupational training programs.

Where possible, it is recommended that both workers and immediate supervisors be surveyed. This helps provide a balance between actual performance and desired performance. Workers respond only to what they each do individually, whereas each supervisor sums across several employees to provide a rating that is representative of all workers of that type under his direct supervision. Together these two response sources can yield good profiles of task relevance when using relatively few respondents. However, where it is possible to survey very large numbers of workers in an occupation (for instance, several thousands of workers), then it becomes more reasonable to omit the supervisor questions as a supportive basis for measuring relevance.

It is also possible to specify the SURVEYING OF WORKERS HAVING CERTAIN AMOUNTS OF *WORK EXPERIENCE* IN AN OCCUPATION. This is particularly important if the purpose of the study is to identify what is relevant to some limited portion of the work force. For example, if the study is intended for use in determining performance content for preemployment or initial job training for an established occupation, then workers with from two to 10 years of occupational experience should predominate in the survey. This range avoids a dominance of task data from those with very limited or very extensive job experience. A majority of very experienced workers would tend to provide unrealistic job activity upon which to base the training needs of new workers. Supervisors should be instructed to consider primarily workers with such experience when answering their task questions.

WHEN THE COMPLETE OCCUPATIONAL SCOPE IS OF INTEREST, then the length of job experience or of career progression can be sampled to obtain similar numbers of respondents from each experience level. For instance, the experience levels could be divided as follows:

- Less than two years — about one-third of the workers
- Two to 10 years — about one-third of the workers
- More than 10 years — about one-third of the workers

Some knowledge of the experience characteristics of the worker population is useful to set meaningful limits on the range of experience desired. Thus, if nearly all available workers have only a year or two of experience, as might occur for a very new and emerging occupation, then obviously those with little experience must predominate. No one rule will fit all occupations.

It should be cautioned, however, that placing restrictions on the population to be surveyed will cause increasing difficulty in administering survey questionnaires to the desired people. And, it becomes nearly impossible to instruct supervisors on what types of workers to report job performance. For most general purposes it is simpler to specify different characteristics of the employment setting than of worker or supervisor characteristics. Thus, types and sizes of employing firms, as well as geographic locations, can serve to produce representative task data, with only a general instruction to focus upon persons within some broad range of experience.

Supervisors should preferably have at least four years of *recent experience supervising workers* of the particular kind involved in the study. To the extent possible, seek persons who have had experience directly supervising a number of workers of this type. If more than one occupation is included in the survey, then different supervisor questionnaires are needed for each specified occupation. This requires that the occupations be known in advance. If they are not known but need to

be identified by job clustering procedures (Step 18), then data for such clustering must be collected and analyzed before administering the supervisor questionnaires.

For most curriculum content purposes the objective is to survey the RANGE OF EMPLOYMENT SETTINGS IN WHICH TRAINEES OVER TIME MIGHT FIND THEMSELVES SEEKING EMPLOYMENT. With the high mobility of the population, this objective directs that a variety of geographic or regional locations, community sizes, employer sizes, and employing industries be the focus of most occupational performance surveys.

There may, however, be special purposes for a survey that direct attention to other sampling variables. These may well justify high concern for obtaining responses of particular types of workers. Or they may indicate that persons other than workers and immediate supervisors should be surveyed.

NOTE: Worker characteristics are not especially important when the purpose of the survey is to aid in validating the content of jobs, for use in constructing nondiscriminatory employment tests. It is the test and its performance content that would be subject to analysis for differential impact on various types of people, not the performance content of the job itself. However, worker characteristics could be of interest for describing the occupational performance of successful workers who have particular physical handicaps or who have varying levels of education and training backgrounds.

Under Conditions II and III cited above, survey emphasis is placed on DATA FROM PERSONS OTHER THAN WORKERS IN THE OCCUPATION. Some performance areas just do not contain enough available persons doing the activities to provide a source of knowledgeable survey respondents. This can occur when the worker group may not be sufficiently literate to read and understand the task statements and questionnaire instructions (prohibiting the use of Questions 1, 3, and 5), or when the occupation is so new and rapidly evolving that the performance of present workers just cannot be accepted as representative of the intended occupation. This situation occurred a decade ago with the occupation of Teacher Aide. The early use of Teacher Aides was then limited for the most part to paperwork and child custodial chores. Teachers, counselors, and administrators would have been more useful sources of the likely significance of the potential work activities (Question 4) than would have the early workforce in that occupation. While there were notable exceptions to this status, it would have been difficult to locate and survey them at the time.

Another possible situation calling for an emphasis on surveying persons other than the workers is WHEN THE PERFORMANCE AREA IS NOT AN EMPLOYED OCCUPATION, BUT IS SOME OTHER DEFINABLE PERFORMANCE SITUATION. For instance, it might be desired to survey such a life performance function as the purchase and sale of a residence. This could include tasks pertaining to obtaining mortgage financing, using real estate firms, identifying property restrictions and encumbrances, evaluating merits of the sale, as well as keeping and using records to calculate the cost basis for tax purposes. Following the general rule for selecting survey respondents, the persons closest to and immediately knowledgeable of the activities to be performed may be real estate, financing, and tax specialists. Or, they may include community individuals who have a special interest in upgrading citizen ability to perform effectively in this function and who have knowledge of the present limitations of key segments of the community for whom skill upgrading is needed. Thus, while the survey approach can be appropriate, its application may have to be flexible to accommodate special purposes to be served.

STEP 9: DETERMINE WHAT RESPONDENT INFORMATION IS NEEDED

Personal data. Depending upon what analyses are to be performed (as described in Step 7), background information to be given by survey respondents can be of different sorts. At a minimum, in most cases, it is useful to obtain information that serves to describe the types of persons who did answer the survey questionnaires. This might include their job title, the industry in which they work, and their length of work experience in that occupation. Figures 4 and 5 illustrate background pages that could be part of a survey questionnaire, one for workers and one for supervisors. These are only suggestive of what questions can be asked. Each application may call for a different set of background items. Such information also serves in Step 17 to verify that the intended kinds of persons did in fact answer the questionnaires.

Notice in these examples that very little background information is sought and the effort required to answer these questions is minimized. Since the survey questionnaire seeks to focus attention and thought on *task* information, it is not good to distract from that focus by including lengthy and difficult background questions. The rule is to *collect only what is important to the study* and to do so in a form that is *reasonably quick and easy to answer.* Thus, checklists of the most likely answers help simplify the response effort (as well as simplify the processing of all questionnaires by assignment of computer codes to each answer). Any time or frequency questions should call for answers in the broadest quantity units that will be useful to the study (for example, years of experience instead of years and months).

If worker training background also is desired, Figure 6 illustrates one possible format for getting worker responses. Information on employment variables such as geographic location and size of firm usually need not be asked, since this information should already have been determined by the person administering questionnaires to workers and supervisors.

Unless of special value to the study, no personal information should be asked: keep the questions directly pertinent to the study. It is the job that is being described by means of this survey, not the population of workers. Thus, questions pertaining to age, sex, race, religion, and marital status are not usually relevant. If for some special purpose there is a need to obtain personal data via the questionnaire, then such questions should receive careful review and approval by an authority responsible for and sensitive to the use of human subjects in such studies. Information on educational background and physical handicaps falls into this need for review and approval. In some cases this may require that informed and voluntary consent of participants be obtained in writing prior to administering the background portion of questionnaires, to comply with professional or governmental principles of conduct (such as: American Psychological Association, 1973; U.S. Department of Health, Education, and Welfare, 1971, 1974).

Equipment used or operated. In Activity B of Volume 2 it was suggested that listings of equipment, tools, and various job aids could be simply listed in a survey questionnaire, and checked for use or operation separate from tasks of the job. Workers should be asked to "check each item they operate or use in their present job assignment." Supervisors, in referring to a particular type of worker under their supervision, should be asked to "check each item used or operated by such workers." The item listings could be set up on a separate background page and listed with adjacent boxes, much as formatted in Figures 4, 5, and 6.

Respondent reactions to survey. In addition to background information, it is often useful to obtain the views of survey respondents on the perceived merits of the questionnaire to their

BACKGROUND INFORMATION

(Use this sheet if you are a SECRETARY, *not* a supervisor of secretaries)

INSTRUCTIONS: Please check the box opposite the *one* item in each section that most appropriately describes your experience. ☑

WHAT IS YOUR PRESENT JOB POSITION? (check the *one* that is most descriptive, regardless of actual job title used in your agency)

- ☐ General Secretary
- ☐ Executive Secretary
- ☐ Legal Secretary
- ☐ Typist
- ☐ Receptionist
- ☐ Office Manager
- ☐ Administrative or General Office Clerk
- ☐ Stenographer or Clerk-Stenographer
- ☐ Medical Secretary
- ☐ Administrative Assistant, or Administrative Officer
- ☐ Other (please write in): _____

IN WHAT KIND OF ORGANIZATION OR INDUSTRY ARE YOU EMPLOYED? (check the *one* most appropriate)

- ☐ Agricultural Production
- ☐ Banking or Finance
- ☐ Communications
- ☐ Construction
- ☐ Distribution or Transportation of Goods or People
- ☐ Education or Training
- ☐ Equipment or Vehicle Servicing
- ☐ Food Processing
- ☐ Health or Safety Services
- ☐ Insurance
- ☐ Legal or Law Enforcement Services
- ☐ Manufacturing of Products
- ☐ Merchandising or Sales
- ☐ Natural Resources (other than Agriculture)
- ☐ Personal Services
- ☐ Utility Services (such as power, water, fuel)
- ☐ Other (please write in): _____

INSTRUCTIONS: Please write in the boxes the number of years of work experience for each of the following questions.

☐ HOW MANY YEARS HAVE YOU WORKED AT YOUR PRESENT JOB? (enter number)

☐ HOW MANY YEARS HAVE YOU WORKED IN THE SECRETARIAL FIELD? (enter number)

Figure 4. Example of brief background questions for workers.

BACKGROUND INFORMATION

(Use this sheet if you are a SUPERVISOR of secretaries)

INSTRUCTIONS: Please check the box opposite the *one* item in each section that most appropriately describes your experience. ☑

WHAT IS YOUR PRESENT JOB POSITION? (check the *one* that is most descriptive, regardless of actual job title used in your agency)

- ☐ Executive Secretary
- ☐ Chief Clerk
- ☐ Office Manager, or Department Manager
- ☐ Head of Secretarial Services
- ☐ Administrative Assistant or Administrative Officer
- ☐ Professional Worker (for example, insurance agent, lawyer, research psychologist, building contractor)—(please write in your job title): _____
- ☐ Other (please write in): _____

IN WHAT KIND OF ORGANIZATION OR INDUSTRY ARE YOU EMPLOYED? (check the *one* most appropriate)

- ☐ Agricultural Production
- ☐ Banking or Finance
- ☐ Communications
- ☐ Construction
- ☐ Distribution or Transportation of Goods or People
- ☐ Education or Training
- ☐ Equipment or Vehicle Servicing
- ☐ Food Processing
- ☐ Health or Safety Services
- ☐ Insurance
- ☐ Legal or Law Enforcement Services
- ☐ Manufacturing of Products
- ☐ Merchandising or Sales
- ☐ Natural Resources (other than Agriculture)
- ☐ Personal Services
- ☐ Utility Services (such as power, water, fuel)
- ☐ Other (please write in): _____

INSTRUCTIONS: Please write in the boxes the number of years of work experience for each of the following questions.

☐ ABOUT HOW MANY TOTAL YEARS OF EXPERIENCE DO YOU HAVE IN DIRECTLY SUPERVISING THE WORK OF GENERAL SECRETARIES? (enter number)

☐ ABOUT HOW MANY RECENT GRADUATES OF JOB TRAINING PROGRAMS DID YOUR IMMEDIATE ORGANIZATION HIRE LAST YEAR FOR THIS OCCUPATION? (enter number)

Figure 5. Example of brief background questions for supervisors.

WHERE DID YOU RECEIVE MOST OF YOUR TRAINING TO QUALIFY AS A SECRETARY? (check the *one* most appropriate) ☑

☐ Senior High School (secondary)	☐ Public Vocational School (secondary)
☐ Technical Institute or Area Vocational-Technical School (postsecondary)	☐ Community Manpower Development Program
☐ Armed Services Technical School	☐ Private Business, Trade, or Technical School or College
☐ Community or Junior College	☐ Senior College or University
☐ Two-Year Branch College	☐ Employer-Sponsored Training Program
☐ Equipment Manufacturer's Training Program	☐ Formal Apprenticeship Program
☐ On the Job (Self Learned)	☐ Correspondence Courses
☐ Previous Work Experience in Other Types of Jobs	☐ Other (please write in): _____ _____

Figure 6. Example of worker background question on prior training.

occupation. Such questions again should be kept brief, simple, and to the point (see Figures 7 and 8 for examples). But they can provide valuable clues to the adequacy of the task statements, the questionnaire format, and the scope of the occupational definition. Particularly negative views may suggest that the survey results are not good indicators of job performance, and the task information may be invalid for the intended purposes. Such possibilities need to be considered, though sometimes they merely reflect the characteristics of an occupation that is in a constant state of change, as occurs in such fields as computer programming. It should also be cautioned that numerous negative replies are to be expected to questions on the length of the questionnaire regardless of whether it takes an individual 30 minutes, 3 hours, or 3 days to complete.

STEP 10: DETERMINE WHAT DATA SUMMARIES AND ANALYSES ARE NEEDED

Summary descriptive data. In general, depending upon the particular type of scale used and the analyses intended (per Step 7), the summary descriptive data for each task could consist of such information as the following:

1. Measures of central tendency or average responses (means, medians, modes).
2. Measures of response dispersion (standard deviations, quartile deviations).
3. Percentage of category use.

THANK YOU FOR YOUR COOPERATION – NOW WE WOULD LIKE TO GET YOUR REACTION:

This page provides an opportunity for you to give us your comments and suggestions. Your judgment and recommendations will be important information for our evaluation of this survey of job performance activities. Feel free to comment at any point.

Please read each of the seven statements below. *Circle* the symbol on the right which best describes your feelings about each statement. These symbols are defined as follows:

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

1.	The description of the occupation being surveyed seemed to include most of my present job assignment.	SA	A	U	D	SD
2.	The general form of the questionnaire seemed reasonably simple and easy to complete.	SA	A	U	D	SD
3.	I feel reasonably certain that my ratings indicate fairly accurately what I do on my job.	SA	A	U	D	SD
4.	I found it reasonably easy to think of my work in terms of the tasks listed in the questionnaire.	SA	A	U	D	SD
5.	The instructions for answering the questions about each task were reasonably clear and understandable.	SA	A	U	D	SD
6.	The statements of the work tasks were reasonably clear and accurate, at least for the ones that are part of my job.	SA	A	U	D	SD
7.	This survey seems to be a good way to describe what workers do in this occupation.	SA	A	U	D	SD

Would you recommend any improvements or corrections for this survey questionnaire? Please describe.

Figure 7. Example of asking workers for their reaction to the survey.

THANK YOU FOR YOUR COOPERATION – NOW WE WOULD LIKE TO GET YOUR REACTION:

This page provides an opportunity for you to give us your comments and suggestions. Your judgment and recommendations will be important information for our evaluation of this survey of job performance activities. Feel free to comment at any point.

Please read each of the seven statements below. *Circle* the symbol on the right which best describes your feelings about each statement. These symbols are defined as follows:

SA = Strongly Agree
A = Agree
U = Undecided
D = Disagree
SD = Strongly Disagree

1.	The description of the occupation being surveyed was sufficient to identify similar employee positions under my supervision in this firm.	SA	A	U	D	SD
2.	The general form of the questionnaire seemed reasonably simple and easy to complete.	SA	A	U	D	SD
3.	I feel reasonably certain that my ratings indicate fairly accurately what my workers in this occupation do on their job.	SA	A	U	D	SD
4.	I found it reasonably easy to think of their work in terms of the tasks listed in the questionnaire.	SA	A	U	D	SD
5.	The instructions for answering the questions about each task were reasonably clear and understandable.	SA	A	U	D	SD
6.	The statements of the work tasks were reasonably clear and accurate, at least for the ones that are performed under my supervision.	SA	A	U	D	SD
7.	This survey seems to be a good way to describe what workers do in this occupation.	SA	A	U	D	SD

Would you recommend any improvements or corrections for this survey questionnaire? Please describe.

Figure 8. Example of asking supervisors for their reaction to the survey.

4. Percentage of use of a specified scale range.

5. Frequency distributions of responses on a scale, and job totals.

6. Scale differences between subgroups of respondents, such as job types within an occupational area or distinct types of respondents within one job type.

7. Number of persons responding to the question.

Most any elementary statistics textbook can be used as a reference source for the appropriate descriptive measures for central tendency and dispersion of responses.

Selected portions of the summary information can be printed out by computer in formats such as those illustrated for a secretarial occupation in Tables A-1 and A-4 in Volume 5. These particular tables present various data for Questions 1, 2, and 3. Printouts for Question 4 would be comparable to the format of Table A-4 of Volume 5. The scale values illustrated for Question 3 are based on the response scales shown in Figure 12, Step 11. These examples are reproduced from a 1974 eight-state survey (Ammerman, Pratzner, & Burgin, 1975).

Questions 1 and 2 (Task Occurrence) are summarized by calculating the percent and number of persons positively checking a task on the survey. Group differences can be calculated and displayed as shown in the last column of Table A-1 (Volume 5). Other columns can be programmed to cite various comparisons for various identified subgroups of respondents in which the study might be interested. In Table A-4 (Volume 5), which reports on an eight-interval scale, the mean and standard deviation are noted, along with a complete printout of the distribution of responses given to each task. Additional columns of data note the percent of the responses that fell within selected parts of the scale (such as categories 1 through 7, and categories 4 through 7, as shown in the table).

The percent rating a task as at least a "substantial part" of the job (categories 4 through 7 on Question 3 or 4) would seem to be a useful indicator of a task's actual relevance to an occupation, serving to differentiate between two job types where workers in both may at times perform the same task. The percentage value does, however, tend to correlate quite highly with the mean (average) scale response to Questions 3 and 4, yielding a relationship between the two measures on the order of .98 or .99. Thus, either would be a suitable measure to use in the statistical clustering processes of Step 18.

Tables of Question 5 summary data for one occupation usually display the tasks rank-ordered on some measure, with associated average percent of time spent on each task by workers who said they did perform, as well as an average proportion of time spent by everyone surveyed in that occupation. An example of this format is given in Table 1, taken from a 1972 survey in one metropolitan area (Borcher & Joyner, 1973). In that study tasks were identified with both a duty and a task alphanumeric code, as can be noted on the left column of Table 1. Such a practice is not used in the present procedures.

Data analyses intended. Analyses which can be performed with the descriptive task-relevance data are:

For a Single Occupation

1. Measure of the inter-rater reliability on Question 3 or 4.
2. Measure of the inter-group consistency on a question.

Table 1

Example of CODAP Printout Format for Question 5 Summary Data
(from use of Types H, I, or J surveys)

TASK JOB DESCRIPTION FOR GENERAL SECRETARY (N=23)

D-TSK		TASK TITLE	Ranked by.....PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
I	3	Answer telephone	100.00	1.54	1.54	1.54
F	1	Compose correspondence	95.65	1.14	1.09	2.63
K	11	File materials	95.65	1.27	1.21	3.84
J	51	Type addresses on envelopes and/or cards	95.65	1.37	1.31	5.15
J	40	Operate typewriter	95.65	1.77	1.69	6.84
J	17	Make folders and folder titles for files (labels)	95.65	1.08	1.03	7.87
J	5	Carry out written or oral instructions given by employer	95.65	1.54	1.47	9.35
J	1	Address letters and packages	95.65	1.33	1.28	10.62
I	15	Place telephone memoranda, messages, etc., where employer will see them	95.65	1.35	1.29	11.92
J	12	Fold and insert letters in envelopes	91.30	1.25	1.14	13.06
J	3	Assemble and staple duplicated materials	86.96	1.40	1.22	14.28
J	56	Type business letters	86.96	1.47	1.28	15.56
J	57	Type carbon copies	82.61	1.49	1.23	16.79
J	6	Change dates on rubber stamps, time stamp machine, and/or calendar daily	82.61	1.05	0.87	17.65
J	4	Attach pertinent correspondence to incoming mail for employer to refresh his memory	82.61	1.11	0.92	18.57
J	18	Make corrections on original and carbon copies	82.61	1.16	0.96	19.52
J	23	Operate copying machine (such as Xerox, Thermofax, ozalid)	82.61	1.38	1.14	20.67
C	28	Sign employer's mail (his signature)	82.61	0.78	0.65	21.31
F	2	Edit letters dictated by employer	78.26	1.02	0.80	22.11
F	11	Type minutes of reports of meetings	78.26	1.10	0.86	22.98
C	9	Keep employer reminded of engagements, dates, things to do, etc.	78.26	1.20	0.94	23.91
F	13	Write shorthand (any system)	78.26	1.17	0.91	24.83
J	10	Compare copy for legibility and neatness	78.26	0.93	0.73	25.56
J	9	Clean and/or tidy own and employer's area	78.26	0.99	0.77	26.33
J	2	Arrange papers or articles on your own and/or your employer's desk	78.26	1.16	0.91	27.24
I	14	Place telephone calls	78.26	1.10	0.86	28.10
J	46	Prepare or obtain coffee or refreshments for employer or his guests	78.26	0.95	0.74	28.84
K	18	Process and file correspondence	78.26	1.15	0.90	29.74
J	66	Type labels individually	73.91	1.09	0.81	30.55
J	62	Type final copy from rough-draft copy	73.91	1.03	0.76	31.31
K	22	Sort materials for filing	73.91	1.09	0.80	32.12
J	45	Prepare forms and correspondence	73.91	1.24	0.91	33.03
J	49	Run errands	73.91	0.77	0.57	33.60
J	48	Proofread typewritten copy	73.91	1.26	0.93	34.53
I	16	Relay or refer telephone calls to another department	73.91	0.95	0.71	35.24
J	8	Clean typewriter	73.91	0.75	0.56	35.80
F	10	Transcribe (type) from shorthand outlines	73.91	1.17	0.86	36.66
I	9	Greet callers and/or visitors	69.57	0.93	0.65	37.31
K	20	Search for lost materials in files	69.57	0.63	0.44	37.75
J	58	Type cards (index cards, file cards, "address finder" cards, etc.)	69.57	0.92	0.64	38.39
K	12	Extract information from files	69.57	1.02	0.71	39.10
J	73	Type memorandums	69.57	1.10	0.77	39.87
L	15	Open and/or read mail	69.57	1.18	0.82	40.69
A	40	Plan work for oneself	69.57	1.02	0.71	41.40

3. Measure of the relationship between summary response data on two task questions.
4. Identification of the degree to which each task is relevant to a particular occupation.
5. Noting of large discrepancies between actual performance of workers and performance expected by immediate supervisors.
6. Separation of nonrelevant from relevant tasks for an occupation.
7. Average number of occupationally relevant tasks performed by any one worker.
8. Average number of occupationally relevant tasks cited as expected of workers by any one immediate superior.
9. Generation of a composite job description, based upon:

    a. Most commonly performed tasks,
    (or)
    b. Tasks which are, on the average, the most significant part of the job.

10. Review of comments and suggestions given by questionnaire respondents.

For an Area Containing Several Clusters of Job Types

1. Clustering of worker respondents into job types, based upon a selected measure of commonality of task performance.
2. Noting of variation in worker backgrounds for each job type.
3. Noting of tasks most representative of a job cluster, or distinguishing one job type from another.
4. Each of the analyses 1 through 9 above for each specific job type.

Guidelines for doing these analyses are given in Step 20 of this volume. Those essential to the intended study should be selected and recorded prior to conducting the remainder of the study. They serve as a firm reminder in the next step, Step 11, of what must be included in the survey design to accommodate these analyses. Where particular worker characteristics or employment settings are to be compared, these should be identified and appropriate background information built into the survey plan or respondent background questions.

STEP 11: DESIGN SURVEY AND ITS ADMINISTRATION

This step involves the putting together of instructions and answer sheets for each question to be used, compiling these into questionnaire booklets for each respondent group, and determining the number and distribution necessary for each booklet. Each is discussed in turn below.

Questionnaire format and forms. Task statements and questions are combined to form one Task Inventory Questionnaire (TIQ) booklet for each selected group of respondents. Thus, for administering questionnaire Type A, two distinct forms of TIQ booklets would be needed. Each would contain the same comprehensive list of tasks developed in Steps 2-6 of Activity C (Volume 2). Associated with the task list in each form of TIQ booklet would be the instructions and answer sections for the question appropriate to that booklet, as noted previously in Figures 2 and 3.

Suggested instructions and answer section formats for Questions 1 through 5 are given in Figures 9, 10, 11, 12, 13, 14, 15, and 16. It can be seen on the figures of the answer sections that TIQ respondents simply place their answers to the right of each task statement. When Question 1 or 2 is used along with a second question, both can be located down the right side of the task lists, as shown in Figure 16 for Question 5. The reader is cautioned that the tasks listed in these figures do not necessarily reflect good quality statements in accordance with Volume 2 guidelines, but are merely illustrative of the format.

When answer section space is not available for all questions to be asked of one respondent group, such as will be required in Volume 4, then a separate answer booklet can be developed to accompany a booklet listing the tasks. This will be explained further in Volume 4. For use of relevancy Types A-J there is no need for an answer booklet bound separately from the task listing.

Instructions to respondents should specifically cite the occupation that is being studied. The intent is to make the material directly relevant to the respondents. Do not address them only in such general terms as "workers" or "employees."

Directions also should ask respondents to write in any tasks which are relevant but not listed, though these need not be rated on the task questions. This write-in request is one reason why each respondent should have all task statements, not some fragment of the list. To employ Question 5 in a survey, it is absolutely necessary for a worker to rate all tasks. Failure to do so makes it impossible to calculate a measure of relative proportion of time spent on each task (see Step 18).

Answer sections should strive to provide the quickest and easiest way for people to answer the questions accurately. It is for this reason that in Figure 14 each alternative category is made available: the respondent needs only to circle his answer. In Figure 11 only a simple checkmark is called for. Figure 16 illustrates an alternative where a number must be written in by the respondent. This is a bit more demanding of the respondent, and lends itself to problems of legibility, but it has been used successfully in many occupational surveys when very large numbers of people are used.

At the top of each answer-section column should be a brief reminder of how to indicate the answer or rating, including a brief key to any scale levels for the question. This should be repeated at the top of each page of the booklet listing the task statements.

In an extreme circumstance the list of tasks might be broken up with different statements appearing on two or three subforms. Such a need can possibly arise when perhaps 2,000 tasks are in the list and it is known that the respondents absolutely cannot have sufficient time to answer for all tasks. Dividing the list by alternately selecting every second or third statement for a separate subform would be possible for Questions 1 through 4, but only when a large number of persons are available to answer each subform. It is not recommended that the list be divided by duty categories, with each subform listing different duties of the job.

QUESTION #1 – "Task Occurrence"

DIRECTIONS FOR REPORTING WHICH ACTIVITIES
YOU PERFORM ON YOUR PRESENT JOB

(Please read this page carefully and completely)

1. *During the last year or so in your present job position as a Business Data Programmer,* which of the activities in the List of Activities have you performed? *Place a check mark* or "X" in the column to the right of each activity statement to indicate which tasks you have actually been doing. Task activities not performed by you should be left blank.

2. Be sure to read every activity listed. Do not depend on the duty labels that are used to group the activities. These duty categories are not definite. They may contain some of your job activities, even when you do not generally perform the duty itself.

3. *Do include* as part of your job:

   a. Recent work experiences as a Business Data Programmer in other offices of your present firm, but *not* for other employers.
   b. Performance of an activity not normally done by you, but that you did do at least once as part of your job, even if it was in a very special or unusual circumstance.

4. Do *not* mark activities:

   a. Done only when you were employed in some other job position (such as Junior Programmer, Engineering and Scientific Programmer, or Systems Analyst).
   b. If you occasionally "assist" someone else to do the activity, but you are not too greatly involved in the performance. However, if you handled a significant portion of the activity (and only you can be the judge of that), the occasion may be counted.
   c. If they are actually performed by an assistant assigned to you, and not by you.

5. In answering this question of *which* activities you actually perform, pay particular attention to the "action verb." The "action verb" is usually the first word of each statement. Do *not* indicate performance of activities done by a subordinate and only supervised by you, *unless* the "action verb" implies such supervision as a part of the activity.

6. The pages of the Task Inventory booklet should not be removed when answering this question; they will need to be in proper sequence later to process your answers along with those of other people answering this question.

NOW TURN TO PAGE 1 OF THE ACTIVITIES LIST,
AND BEGIN MARKING YOUR ACTIVITIES IN THE BOXES PROVIDED.

Thank you for your participation in this study.

Figure 9. Instruction sheet for Question 1 (workers).

QUESTION #2 – "Task Occurrence"

DIRECTIONS FOR REPORTING WHICH ACTIVITIES SHOULD BE PERFORMED AS PART OF THE JOB

(Please read this page carefully and completely)

1. From your experience as a supervisor of one or more Business Data Programmers, indicate *which* of the activities in the List of Activities *should be* performed by Business Data Programmers in your operation; that is, by such employees under your supervision in your office or firm. *Place a check mark* or "X" in the column to the right of each activity statement to indicate which tasks your Business Data Programmers should be doing as part of their job, even if only done once. Task activities not part of the job for any of your Business Data Programmers should be left blank.

2. Be sure to read every activity listed. Do not depend on the duty labels that are used to group the activities. These duty categories are not definite. They may contain some relevant job activities, even when the duty itself is not generally performed.

3. *Do include* as part of the job:

   a. Activities that your programmers occasionally are expected to do, but that are not normally part of their job.
   b. Activities that are to be performed by only *one* of your staff of Business Data Programmers, even if they are not part of every programmer's job.

4. Do *not* mark activities:

   a. If done *only* by other types of job positions is your office (such as Junior Programmers, Engineering and Scientific Programmers, or Systems Analysts).
   b. If your Business Data Programmers only lend occasional assistance to another worker performing a task, and are not responsible for the effective performance of that task.

5. Do *not* rate your own job; rate only the work of programmers you supervise.

6. In answering this question of *which* activities should be performed by a Business Data Programmer in your office, pay particular attention to the "action verb." The "action verb" is usually the first word of each statement. Do *not* indicate performance of activities done by a helper or other worker that is supervised by a Business Data Programmer, *unless* the "action verb" implies such supervision as a part of the programmer's activity.

7. The pages of the Task Inventory booklet should not be removed when answering this question; they will need to be in proper sequence later to process your answers along with those of other people answering this question.

NOW TURN TO PAGE 1 OF THE ACTIVITIES LIST,
AND BEGIN MARKING THE RELEVANT ACTIVITIES IN THE BOXES PROVIDED.

Thank you for your participation in this study.

Figure 10. Instruction sheet for Question 2 (supervisors).

LIST OF ACTIVITIES

For Business Data Programmers

(Activities are grouped under 12 general duty areas)

	CHECK ☑ if part of job
DUTY A: SYSTEM ORGANIZING AND PLANNING ACTIVITIES	
1. Analyze company operations to determine where most significant improvements can be made.	☐ 1
2. Analyze data processed for possible modification and combination of reports.	☐ 2
3. Analyze data processed to make sure that desired information is obtained.	☐ 3
4. Analyze documentation for completeness and accuracy for data processing operations and control.	☐ 4
5. Analyze functional area reports for format errors.	☐ 5
6. Balance and correct reports.	☐ 6
7. Brief supervisor and staff.	☐ 7
8. Conduct on-the-job training for data services personnel.	☐ 8
9. Coordinate work of data services unit with activities furnishing report data.	☐ 9
10. Develop standards and factors for use in management control systems.	☐ 10
11. Establish data services production controls and standards.	☐ 11
12. Evaluate work performance of data services personnel.	☐ 12
13. Fill out questionnaire inventory forms.	☐ 13
14. Inspect methods used to process data.	☐ 14
15. Orient newly assigned data services personnel.	☐ 15

Figure 11. Answer section format for Questions 1 and 2.

QUESTION #3 – "Extent Task Is Part of the Position"

DIRECTIONS FOR REPORTING HOW MUCH EACH TASK IS A PART OF YOUR JOB

(Please read these pages carefully and completely)

1. Answer this question so as to give the best description you can of what you do in your present job as a Business Data Programmer. For each task statement in the List of Activities consider *how significant* a part of your job it is. This may be done in two steps:

   First, consider whether the activity is a part of your job. If your answer is NO, then the task item is definitely not part of your position.

   Second, and only if the item does apply to your job, *decide how significant a part of your position* it represents.

2. Be sure to read every activity listed. Do not depend on the duty labels that are used to group the activities. These duty categories are not definite. They may contain some of your job activities, even when you do not generally perform the duty itself.

3. *Circle* the appropriate answer to the right of each activity statement. Please make a rating for every item listed in the booklet.

4. For each item, choose a value between 0 and 7 according to the following rating scale:

   0 = Definitely *not a part* of my job position, does not apply, or is not true for this job.
   1 = Under unusual circumstances may be a *minor part* of my job.
   2
   3
   4 = A *substantial part* of my job.
   5
   6
   7 = A *most significant part* of my job.

   Use all eight scale values, as appropriate. The ratings of "2" and "3" represent intermediate levels between "MINOR" and "SUBSTANTIAL" parts of the job. Similarly, the ratings of "5" and "6" represent intermediate levels between "SUBSTANTIAL" and "MOST SIGNIFICANT" parts of the job. Thus, the scale represents a series of increasingly higher levels of the extent to which a task is considered part of the job. Your rating of a task might be at any one of these levels.

5. If the activity statement *does describe* one part of your job, then consider and weigh *all* of the following factors:

   a. Its *importance* (that is, its contribution to effective operations in your office or firm).
   b. Its *frequency of occurrence* (that is how often you do it).
   c. Its *relevance* (that is, how appropriate or pertinent it is to your job assignment).
   d. *And,* any other factor which you think determines to what extent the task is *part of your position.*

   In your own mind, combine these factors into a *single* rating of how significant a part of your job it represents, using a value from 1 through 7 to represent your combined rating. Then *circle* that value opposite the activity statement.

6. If the statement describes an activity that does not apply to, or is not true for your job, then *circle* the "0" category on the answer scale. This answer also should be used for any activities done entirely by a subordinate, assistant, helper, or trainee you may supervise. In considering whether an activity is actually part of *your* job, pay particular attention to the "action verb." The "action verb" is usually the first word of each statement. If an activity is supervised but not performed by you, *do not count* it as part of your job *unless* the "action verb" implies such supervision as part of doing the activity.

7. EXAMPLES:

   a. To indicate an activity that is a substantial part of your job, circle the 4:

      0 1 2 3 (4) 5 6 7

   b. To indicate an activity that is a considerable part of your job, having major significance, probably circle the 6:

      0 1 2 3 4 5 (6) 7

8. The pages of the Task Inventory booklet should not be removed when answering this question; they will need to be in proper sequence later to process your answers along with those of other people answering this question.

Thank you for your participation in this study.

Figure 12. Instruction sheet for Question 3 (workers).

QUESTION #4 – "Extent Task Is Part of the Job"

DIRECTIONS FOR REPORTING HOW MUCH EACH TASK IS A PART OF THE JOB

(Please read these pages carefully and completely)

1. Answer this question so as to give the best description you can of what Business Data Programmers do in your operation; that is by such employees under your supervision in your office or firm. For each task statement in the List of Activities consider *how significant* a part of their job it is. This may be done in two steps:

   First, consider whether the activity should be performed by them in your operation. If your answer is NO, then the task item is definitely not part of their expected work assignments. This would include activities done *only* by other types of job positions in your office (such as Junior Programmers, Engineering and Scientific Programmers, or Systems Analysts).

   Second, and only if the item does apply to your programmers, decide *how significant a part of their job* it represents.

2. Be sure to read every activity listed. Do not depend on the duty labels that are used to group the activities. These duty categories are not definite. They may contain some of their job activities, even when they do not generally perform the duty itself.

3. *Circle* the appropriate answer to the right of each activity statement. Please make a rating for every item listed in the booklet.

4. For each item, choose a value between 0 and 7 according to the following rating scale:

   0 = Definitely *not a part* of their job, does not apply, or is not true for this job.
   1 = Under unusual circumstances may be a *minor part* of their job.
   2
   3
   4 = A *substantial part* of their job.
   5
   6
   7 = A *most significant part* of their job.

   Use all eight scale values, as appropriate. The ratings of "2" and "3" represent intermediate levels between "MINOR" and "SUBSTANTIAL" parts of the job. Similarly, the ratings of "5" and "6" represent intermediate levels between "SUBSTANTIAL" and "MOST SIGNIFICANT" parts of the job. Thus, the scale represents a series of increasingly higher levels of the extent to which a task is considered part of the job. Your rating of a task might be at any one of these levels.

5. If the activity statement *does describe* one part of their job, then consider and weigh *all* of the following factors:

   a. Its *importance* (that is, its contribution to effective operations in your office or firm).
   b. Its *frequency of occurrence* (that is, how often a programmer does it).
   c. Its *relevance* (that is, how appropriate or pertinent it is to their job assignment).
   d. *And*, any other factor which you think determines to what extent the task is *part of their job.*

   In your own mind, combine these factors into a *single* rating of how significant a part of the job it represents, using a value from 1 through 7 to represent your combined rating. Then *circle* that value opposite the activity statement.

6. If the statement describes an activity that does not apply to, or is not true for the job, then *circle* the "0" category on the answer scale. This answer also should be used for any activities done entirely by their subordinates, assistants, helpers, or trainees that they may supervise. In considering whether an activity is actually part of the job, pay particular attention to the "action verb." The "action verb" is usually the first word of each statement. If an activity is supervised but not performed by them, *do not count* it as part of their job *unless* the "action verb" implies such supervision as part of doing the activity.

7. Do *not* rate your own job; rate only the work of programmers you supervise.

8. EXAMPLES:

   a. To indicate an activity that is a substantial part of the job, circle the 4:

      0 1 2 3 (4) 5 6 7

   b. To indicate an activity that is a considerable part of the job, having major significance, probably circle the 6:

      0 1 2 3 4 5 (6) 7

9. The pages of the Task Inventory booklet should not be removed when answering this question; they will need to be in proper sequence later to process your answers along with those of other people answering this question.

Thank you for your participation in this study.

Figure 13. Instruction sheet for Question 4 (supervisors).

LIST OF ACTIVITIES

For Business Data Programmers

(Activities are grouped under 12 general duty areas)

Key to abbreviations:

0 = Definitely *not a part* of my job.
1 = Under unusual circumstances may be a *minor part* of my job.
2
3
4 = A *substantial part* of my job.
5
6
7 = A *most significant part* of my job.

DUTY A: SYSTEM ORGANIZING AND PLANNING ACTIVITIES — *Circle one* category for each item.

1.	Analyze company operations to determine where most significant improvements can be made.	0	1	2	3	4	5	6	7
2.	Analyze data processed for possible modification and combination of reports.	0	1	2	3	4	5	6	7
3.	Analyze data processed to make sure that desired information is obtained.	0	1	2	3	4	5	6	7
4.	Analyze documentation for completeness and accuracy for data processing operations and control.	0	1	2	3	4	5	6	7
5.	Analyze functional area reports for format errors.	0	1	2	3	4	5	6	7
6.	Balance and correct reports.	0	1	2	3	4	5	6	7
7.	Brief supervisor and staff.	0	1	2	3	4	5	6	7
8.	Conduct on-the-job training for data services personnel.	0	1	2	3	4	5	6	7
9.	Coordinate work of data services unit with activities furnishing report data.	0	1	2	3	4	5	6	7
10.	Develop standards and factors for use in management control systems.	0	1	2	3	4	5	6	7
11.	Establish data services production controls and standards.	0	1	2	3	4	5	6	7
12.	Evaluate work performance of data services personnel.	0	1	2	3	4	5	6	7
13.	Fill out questionnaire inventory forms.	0	1	2	3	4	5	6	7
14.	Inspect methods used to process data.	0	1	2	3	4	5	6	7
15.	Orient newly assigned data services personnel.	0	1	2	3	4	5	6	7

Figure 14. Answer section format for Question 3.

INSTRUCTIONS FOR COMPLETING TASK INVENTORY

Carefully read each of the Task Statements and place a check mark (✓) in the column labeled *Check* for each task which you perform on your present job.

After checking all tasks which you perform, then rate only the task you have checked by placing a number 1, 2, 3, 4, 5, 6, or 7 in the column labeled *Time Spent* which most closely estimates the amount of time you spend in performing the task.

Time Spent means the total time you spend on each task you are rating, compared with the time you spend on each of the other tasks you do.

At the bottom on any page, write in and rate any tasks you do which are not listed.

EXAMPLE:

DATA PROCESSING TASK INVENTORY		Page _____ of _____ Pages
LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.	CHECK	TIME SPENT
	✓	1. Very Much Below Average 2. Below Average 3. Slightly Below Average 4. About Average 5. Slightly Above Average 6. Above Average 7. Very Much Above Average
K. PROGRAMMING COMPUTERS	If Done	
1. Adapt programs written in symbolic language to different computer configurations.	✓	4
2. Analyze applications to select appropriate utility programs and subroutines.	✓	2
3. Analyze computer inputs prior to test run and follow-up.	✓	1
4. Analyze programming documentation.		
5. Audit computer inputs after test run and follow-up.	✓	6
6. Code computer applications using a reports program generator.		
7. Code programs utilizing more than one language.	✓	7

Figure 15. Instruction sheet for Question 5 (workers).

DATA PROCESSING TASK INVENTORY		Page 14 of 26 Pages
LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.	CHECK	TIME SPENT
H. OPERATING AUTOMATIC DATA PROCESSING EQUIPMENT	√ If Done	1. Very Much Below Average 2. Below Average 3. Slightly Below Average 4. About Average 5. Slightly Above Average 6. Above Average 7. Very Much Above Average
1. Analyze job steps to determine data recovery points.		
2. Analyze machine operation through use of messages received from the equipment.		
3. Analyze machine operation through use of conditions displayed.		
4. Determine cause of machine stops and malfunctions.		
5. Interrogate memory locations on the console.		
6. Load programs and data cards.		
7. Locate tapes in storage media or tape library.		
8. Maintain card files (source object, etc.).		
9. Maintain current run tapes.		
10. Maintain levels of data processing supplies.		
11. Maintain technical files on equipment operation and procedural changes.		
12. Make switch settings.		
13. Operate card reader.		
14. Operate collator.		
15. Operate console.		
16. Operate decollator.		
17. Operate document writer.		
18. Operate forms bursting equipment.		
19. Operate interpreter.		
20. Operate key punch machines or verifiers.		
21. Operate magnetic tape unit.		
22. Operate paper tape punch and reader.		

Figure 16. Answer section format for Question 5.

Develop plan for selecting respondents. Plans for the kinds and numbers of persons to be administered the survey form should specify three items of information:

1. Number of persons needed for each group or set of TIQ booklets.

2. Background distribution of respondents within the defined scope of interest.

3. Occupational and situational distribution of respondents, consistent with the defined scope of interest.

For a *single prescribed occupation, at a minimum* (regardless of the selection plan), there should be at least 30 usable questionnaires returned per worker group and at least 30 usable questionnaires returned per supervisor group. [Fifty (50) is a far preferable minimum, but it is realized that such a number may be difficult to achieve in all circumstances.] This number is necessary to assure adequate stability of the summary data. These minimum group sizes also are appropriate for any prescribed subgroup of respondents for which special summaries are desired in the study.

More desirably, up to 50% of workers in a small occupation, or at least 500 workers in larger occupations, are suitable goals for occupational performance surveys. These numbers lend greater assurance that all meaningful performance situations will be adequately represented in the questionnaire data. Such numbers are quite feasible for surveys (a) within a large employing organization, (b) across the membership of a cooperating professional or labor association, or (c) whenever compensatory payment to each respondent and/or employer is unnecessary.

For a *cluster of jobs in an occupational area,* such as when specific job types are not known for certain, or cannot readily be identified with particular workers, then the *minimum* numbers of respondents is increased. If the job types and the workers in each are known with reasonable certainty, usable returns from at least 30 workers and 30 supervisors *for each likely job type* are needed. If such job types and their incumbent workers are highly uncertain, then surveys from about 500 workers across the occupational area would generally be needed to yield effective job clusters in Step 18.

More complete representation of an occupational area usually involves up to several thousands of those employed in the area. Descriptive summaries can be performed with no methodological limit on the number of respondents, the real limiting factor being the expense of keypunching the responses for computer processing of the data. For job clustering applications, however, the number of persons surveyed should be limited to the capacity of the available computer clustering or factoring program. Usual hand-calculated clustering techniques can reasonably handle only up to about 20 or 30 respondents, factor analysis programs about 150 to 180, and the Air Force's CODAP clustering accommodates up to 2,000.

The techniques with very limited capacity are useful for identifying perhaps three or four specialty areas that may be emerging within a single occupation. They are not very effective in broad surveys of an occupational area which includes a range of occupations and many specialty areas.

When seeking minimum numbers of usable questionnaire returns the administration of the survey must be kept tightly controlled. Respondents and/or their supervisors must be individually contacted and direct follow-up conducted as necessary to secure completed questionnaires. Also, an additional 15 to 25% of questionnaires per group should be administered to allow for losses that can be anticipated due to faulty responses or failure to respond.

Techniques for administering surveys to assure high usable return rates are discussed under Activity E, and particularly Step 13.

To encourage a full representation of the defined scope of occupational interest in the smaller sample surveys, it is useful to place some constraints upon the types of individuals and of employment settings to be involved. Length of job experience, individual job assignment, geographic location, size of local work unit, and type of employing agency or firm seem to be the most crucial factors to control in most surveys (though special purposes of a study may require control of other factors).

Worker and supervisor factors can be specified on the directions given to those persons who will be making the direct contacts with individuals and/or their employers.

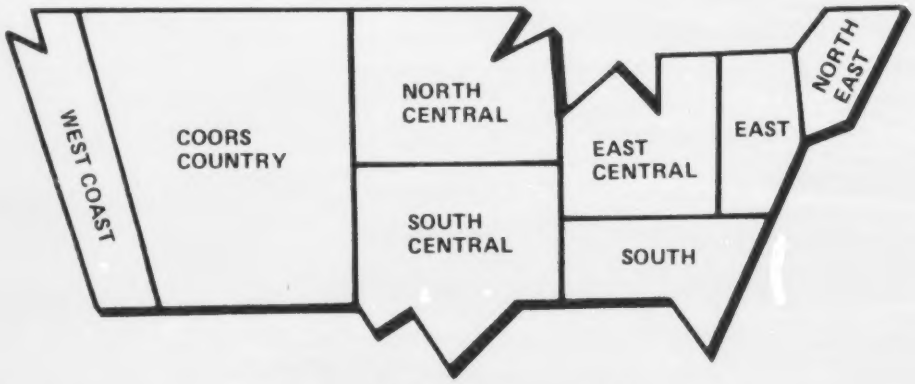
Figure 17 portrays one such set of administrator instructions. Note that it defines the occupation of interest (per Step 1), including specialty areas that may or may not be included.

The desired number and types of employment settings for many surveys can often be displayed quite simply by a matrix and an outline map. For example, workers in the following proportions might be sought overall and within each geographical division used in the study:

		Type of Employing Agency or Firm		
		Public Service Agency (government, education)	Private Business and Industry	
Size of Local Work Unit	Small Operation (less than 15 workers in the job area)	20%	25%	45% of group
	Large Operation (20 or more workers in the job area)	30%	25%	55% of group
		50% of group	50% of group	

The proportions can be translated into actual numbers when the total number to be surveyed is decided. This prevents local administrators from acquiring a predominance of one type on the basis of ease of local access to workers. If community population density (such as rural, small town, major metropolitan area) is also of concern, then designation of such can be added to these requirements.

Geographic distribution nationally might be portrayed simply as follows, with equal representation from each regional division to give a reasonable representation of geo-economic area across the nation. One or more localities in each region could be used for contacting workers and supervisors. Similar depictions could be made for regional or statewide areas when the intent of the survey scope is less than national.



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DIRECTIONS FOR IDENTIFYING EMPLOYEES TO BE ASKED TO COMPLETE A QUESTIONNAIRE ON THE TASKS OF AUTOMOTIVE MECHANICS

1. Workers selected to answer the Task Inventory Questionnaire should be employed full-time as Automotive Mechanics. They should preferably have at least four but not more than 10 years of work experience as an Automotive Mechanic. Though a few are acceptable, try to avoid those with very little job experience or the very senior workers in the occupation.

   An Automotive Mechanic is one who repairs and overhauls automobiles, light buses, light trucks, and other automotive vehicles. They may diagnose damage or malfunctions, remove and replace units, disassemble and inspect parts for wear and servicing, overhaul units, rebuild parts, rewire electrical systems, reline or adjust units. They do *not* typically mend damaged body and fenders, *nor* install or repair accessories such as radios. They may become specialists in one area of automobile repair (such as transmissions, engine tune-up, or brake repair) but must possess general skills listed above.

   These workers may use such other job titles as Auto Mechanic, Automobile Repairman, Garage Mechanic, or Engine-Repair Mechanic. Though qualified in general automotive mechanics, their immediate job assignment could be limited to particular repair functions such as carburetors, front-end, differential repair, or tune-up.

   Workers should *not* be selected who are (a) less than full-fledged mechanics, such as repair helpers or assistants; (b) specialized in nonautomotive or peripheral systems, such as industrial trucks, diesel truck engines, farm equipment, or motorcycles; (c) limited in *qualification* to one specialty area such as body repair, electrical systems, service station mechanic, or air conditioning; and (d) supervisors or service managers.

2. Supervisors of Automotive Mechanics selected to answer the Task Inventory Questionnaire should be those persons who organizationally are located immediately above the type of worker described for this study. They need not be the immediate supervisor of the particular workers selected, but should normally supervise the work of that type of worker. It is preferred that they have at least four years of recent experience supervising a number of Automotive Mechanics.

   These persons supervise and coordinate the job activities of Automotive Mechanics engaged in repairing, adjusting, servicing, and storing motor vehicles. They may inspect and drive repaired vehicles to verify repairs, schedule the transporting of materials to service or storage areas, study repair schedules and estimate time/cost requirements, make work assignments to workers, analyze and resolve work problems, recommend or initiate personnel actions, and similar supervisory activities.

   These supervisors may have such job titles as Service Manager, Garage Owner, Repair Shop Manager, Service Advisor, Shop Foreman, or Chief Mechanic.

Figure 17. Example of instructions to TIQ administrators regarding the kinds of persons to be selected for the survey.

For studies by public school systems to derive training curriculum content, adjacent states should be included in the survey if statewide rather than national geographic scope is intended. This would help assure that students become prepared for effective employment in the full labor market area in which they are likely to find their opportunities. With mobility trends being what they are, the manpower requirements of a single state would not seem to serve the best interests and needs of the student population.

Appropriate representation of the employment settings for an occupation remains somewhat of a debatable issue, particularly when the survey purpose is to identify curriculum content. Should the survey equally represent all types of employment settings so that trainees may be prepared for a variety of employment opportunities as conditions and the job change over time? Or, should the focus be upon predicted manpower requirements? Opting for manpower forecasts has the appearance of sound planning and practicality. On the other hand, broadening employment options for the individuals to be trained seems more attuned to the career needs of students, with training programs encouraging the development of skills that can more readily transfer to new performance contexts. Considering the limitations of current manpower forecasting methods, their inability to deal with the myriad of small jobs and specialty areas having relatively minor manpower requirements by themselves, and the constantly evolving technology and demand for many occupations, it would seem more appropriate to base representation first upon the broader range of possible employment situations. This would tend to furnish training appropriate for students in areas of low population density as well as for those in major metropolitan areas. A balance of concerns could then be obtained by augmenting the focus in those particular performance contexts that have obviously high potential for near-term employment opportunities. By this means it may perhaps be possible to acquire the "best of both worlds."

Employment sites of surveyed workers, thus, should range from large metropolitan areas, to moderate-sized or remotely situated cities, to small scattered communities. Some emphasis, however, would be upon the larger population centers.

Business enterprises to be contacted at each selected location may be essentially targets of opportunity, within the constraints of the survey plan. These are ones that are available and accessible to survey administrators in each locale.

This diversity of locations and industries, distributed across major regions of the country (or other geographic units of the scope of interest), should approximate a reasonable representation of the overall work situation in which workers in the occupation obtain employment. The range of variations included in the survey should certainly lend assurance of the meaningfulness of the data where consensus is achieved, while acknowledging the diversity of position assignments encompassed within an occupation. Information about this concensus and diversity could be helpful as one basis for making students aware of job opportunities, employment openings, and areas for skill application.

STEP 12: PRETEST QUESTIONNAIRE INSTRUCTIONS AND FORMAT

The first time a new or somewhat different population is to be administered a survey questionnaire form it should be tested out on a small sample of persons of the kind to be surveyed. This serves two purposes. First, it assures that such a group can read and understand the questionnaire, and that the personal background items are pertinent to that group. The second purpose is to gain experience in locating the kinds of respondents needed for the survey. If certain kinds are found to

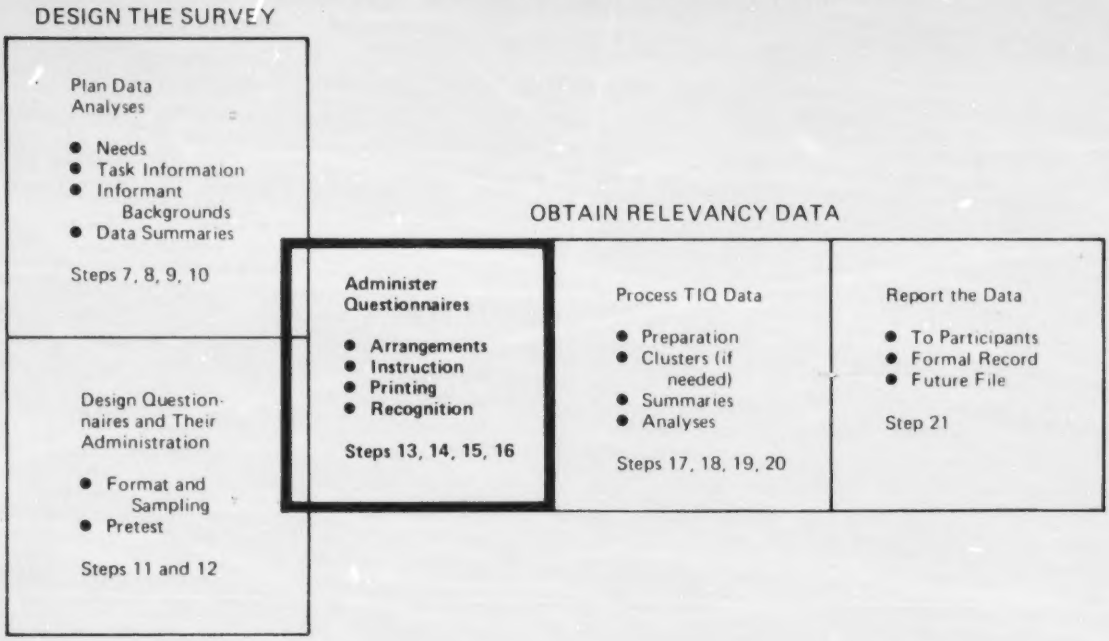
be very difficult to identify or gain access to, this will have definite implications for the arrangements necessary in Step 13. It may even be found necessary to reconsider the survey plan devised in Step 11. In any event, it is better to discover such problems before attempting to gather the full set of task data.

This pretesting can be done with a handful of persons who represent the range of those for whom the survey is intended, especially in terms of experience and reading ability. It is not necessary to employ strict sampling procedures to identify suitable persons. Often it may be practical to obtain this firsthand feedback simultaneously with the pilot testing in Step 6 of Volume 2. The responses obtained may also be used to exercise the data processing programs for Steps 17 and 19, to assure proper programming and layout of output.

Individuals should be asked to comment on their understanding of the questions and the procedures to be followed. If they feel that certain changes in the wording of questions would improve their communicability, they should be encouraged to offer their suggestions. Additionally, if at all feasible, they should be paid for their service, consistent with their hourly rate of pay.

If this pretesting dictates that the total administration time for a person to respond must be shortened, it is possible to randomly divide the tasks within each duty area to form more than one survey booklet (except for questionnaire Types H, I, and J). Sufficient numbers in each comparable group of respondents will be necessary to permit the group data to be pooled as if it all came from the same person.

ACTIVITY E: ADMINISTERING QUESTIONNAIRES TO WORKERS AND SUPERVISORS



Given that both the design of the occupational survey and the intended data analyses have been planned in Activity D, it then becomes appropriate to arrange for and accomplish the actual administration of the survey. Survey administration efforts under this Activity E involve primarily the making of appropriate arrangements and obtaining printed questionnaires for each intended respondent. There are four procedural steps to be followed in accomplishing this administration:

- Step 13: Arrange to Have Questionnaires Administered
- Step 14: Instruct Local Administrators
- Step 15: Prepare Questionnaire Booklets
- Step 16: Acknowledge Cooperation of Agencies and Personnel

Each of these steps is described in the sections which follow. In accomplishing Activity E attention should be given to maximizing the motivation of survey administrators, of local employers, and of workers and supervisors responding to the survey questionnaires. Respondent motivation is particularly important in obtaining meaningful and accurate information on each task. Unless completion of the survey is made to seem desirable, participating individuals may not do their best in later

portions of task listings or in final stages of making local contacts with employers and employees. However, as Guion (1976) notes, "specific attempts to increase motivation probably have an impact only up to some point; beyond that they are self-defeating" (p. 803). The recommendation to maximize motivation often may be, therefore, difficult to carry out effectively.

STEP 13: ARRANGE TO HAVE QUESTIONNAIRES ADMINISTERED

Obtaining survey responses efficiently from many individuals can be difficult to accomplish. Thus, along with Step 14, this step is most critical in obtaining useful questionnaire returns. These steps also are the most sensitive in terms of assuring protection of the interests and welfare of employees, and of making certain that employers or other cooperating organizations do not become alienated by the survey effort.

Methodologically there are two key questions in the process of making arrangements to have Task Inventory Questionnaires administered to workers and immediate supervisors. The first is: How do you locate the right kinds of employees and secure their participation? This is followed by the problem of: What can be done to encourage full return of completed questionnaires?

The guidelines suggested here assume a situation where a broad national or regional survey for a single occupation is planned, with a diversity of locations and industries. Appropriate modifications should be obvious when only a single major employer or one metropolitan area are to be the intended scope of interest. Additionally, if workers only are to be surveyed (as in questionnaire Types C, F, H, I, and J), it is possible to mail questionnaires directly to those workers. This can be done with the sponsorship or cooperation of a professional or labor association to which they belong, with mailings made from the association's membership list. Accompanying such mailings should be a letter from the association indicating the association's backing and endorsement of the survey, and encouraging membership response to it. Alerting their membership through association newsletters and periodicals is most useful. Similarly, if all respondents are to be from a single large operating agency, a message from the top of that agency to all lower units assures respondents that prompt completion of the questionnaire is of interest to and sanctioned by the management.

Local administrators. Key individuals in each locale are needed who are knowledgeable of specific employment locations and are available to make direct contact with those employers. Though they may commission others to aid in the process, these key individuals serve as the focal point for local contacts, distribution of questionnaires, and short-term follow-up to complete the effort.

Various agencies conducting an occupational performance survey may have their own sources of key local administrators, such as a firm's network of operating divisions throughout the country, or local chapters of an association or a union.

For surveys conducted by or for public education agencies it has been found very effective to contract with the directors of state units concerned with occupational or vocational education. These include especially the state Instructional Materials Laboratories (or Curriculum Coordinating Units) or state Research Coordinating Units, in those states having such units. Other key individuals within state departments of vocational or occupational education also can be very supportive of the survey administration. Together they can serve as a very effective network for gathering occupational performance data, which can also be of mutual benefit to their respective constituencies.

These individuals may themselves make direct contact with employers and/or employ others familiar with local communities. Effective in this role are professors of vocational education (particularly of business education) in the state's higher education system and secondary/postsecondary vocational teachers in local school systems. By this means responsible community personnel who are knowledgeable of local employment settings and acquainted with a number of employers provide the personal contact that is so essential for obtaining good survey responses and questionnaire returns. A side benefit has been obtained by increasing their acquaintance with local employment opportunities having relevance to the subjects they teach.

The key administrators in each area are best contacted directly, in person or by phone, to secure their cooperation and participation. A contract for their services or for the purchase of a certain number of completed questionnaires is then issued to their agency or to them as individuals, depending on the circumstances in each situation. This contract agrees to pay a set amount for each completed questionnaire, such as $10 or $20 for a short questionnaire, to $40 or $50 for a lengthy complex questionnaire involving difficult arrangements in securing the required respondents. These monies may be used as necessary to compensate employers and/or employees for time used to answer each questionnaire.

Local administration process. Local employers should be contacted and informed of the nature and needs of the survey. Their approval for contacting specific workers and/or supervisors should be obtained. Often in small organizations they will themselves serve as the point of contact with particular employees, or introduce the local administrator to them. In other instances they may designate another person in the organization to serve that role.

Depending on the nature and scope of the survey, sometimes it may also be useful to secure the endorsement of relevant associations of employers to encourage participation by these business firms. This kind of endorsement, however, takes some time to acquire. Associations may need to clear their action with their governing board at its next meeting. It may at times also be appropriate to inform and secure the backing of a local employees union, though typically too few workers are used from any one firm to make this a significant and necessary part of the process.

Telephone employers in advance for an appointment. It is important that the normal lines of communication within an organization be followed. Initial contact should always be sought with the top management of the local operation; that is, with the owner of a small business, the general manager, personnel manager, or other person having general responsibility over the employees. The objectives of the survey and its outcomes that may benefit the business or the employees should be explained. The occupation or area being surveyed must be carefully described so as to identify the kinds of employees to be included. If intermediate supervisors are to be involved in distributing the inventories, it is helpful if they are also personally contacted.

The local survey administrator, along with the employer or manager, should identify the specific kinds and number of employees who are to receive the questionnaire at each location. Voluntary cooperation should be solicited without using coercive pressure. A positive and appreciative attitude toward the survey is most desirable.

Each questionnaire is a complete package for self-administration. Some managers may prefer to distribute the questionnaires, and then have the employees mail them directly to the local administrator when completed. If this is done, each employee should be asked to notify the manager (or his representative) when the booklet has been mailed, permitting the manager to monitor which questionnaires have been completed. Other managers may prefer to have completed questionnaires returned to their office for forwarding to the local administrator. Higher and faster completion

rates are obtained when managers are interested enough in the survey to collect the questionnaires from their employees.

STEP 14: INSTRUCT LOCAL ADMINISTRATORS

If at all possible, all the key local administrators should be gathered together at one central location for a day to discuss their role. This serves to give each a common understanding of what's intended, and an opportunity to raise questions about the process. It is most helpful if they all fully understand what is being done, and the reasons for it. With such a sense of purpose and value their participation should be enhanced. This meeting should be held at or just before the time the survey questionnaires are ready for distribution.

Each administrator should be given written instructions describing what issues to attend to, with particular attention to protecting the privacy of respondents and securing voluntary participation. The instructions should also indicate possible ways of thanking and acknowledging the contribution of each participant (per Step 16). An example of one such possible set of administrator instructions is illustrated in Figure 18. These would accompany the occupational definitions such as given in the Figure 17 example.

Of special importance is the need for local administrators to report information regarding the nature of each employment setting used. This data can add to the background information pertaining to each questionnaire. A simple worksheet, as in Figure 19, should be made available to record and transmit this information. It should key each item to a specific respondent by means of a predetermined code for each questionnaire booklet (see Step 15).

Additional Information and Guidance to Help in the Local Administration of Task Inventory Questionnaires

1. *Identifying Employees to Answer the Questionnaire*

   Persons selected to answer the Task Inventory Questionnaires should be as noted on the attached sheet describing workers and supervisors.

2. *Types of Employer Agencies Needed*

   The following chart indicates the number of each type of employing agency to obtain for the particular types of employees:

		Workers	*Immediate Supervisors*
a.	Government Service or Education (*small* operation: less than 15 employees in the job area)	2	2
b.	Government Service or Education (*large* operation: 20 or more employees in the job area)	3	3
c.	Private Business or Industry (*small* operation: less than 15 employees in the job area)	4	4
d.	Private Business or Industry (*large* operation: 20 or more employees in the job area)	3	3

3. *Inform of Purpose*

   Each questionnaire respondent, as well as each higher agency official contacted, should be informed of the purpose of the Task Inventory Questionnaire. The following comments are provided for your possible use in telling employers of the purpose of this data-collection effort:

> The purpose of this questionnaire is to identify what job tasks are relevant to the occupation being surveyed. This information will be used in a curriculum project to identify the extent to which each task is relevant to that occupation, serving as one basis for assuring that training is directed at the more relevant tasks.
>
> A composite of several questionnaires for that occupation will be used as the basis for analyzing what task skills are now performed and expected of workers. This composite will represent a cross-section of geographic and industry views.
>
> The problem is not a simple one on which to obtain concensus. Each job position has its own set of requirements and assignments. The questionnaires will be analyzed to identify significant parts of the occupation.

   Additional copies of questionnaires are included for leaving with management officials, as you deem appropriate.

4. *Time-Saving Features*

   There are several time-saving features built into this questionnaire. It may be useful to tell participating employers of these, to assure them that we were aware of the value of their time.

Figure 18. Example of instructions to local administrators.

a. Questions on background information are kept to a minimum absolutely necessary to this survey.

b. By use of prepared listings of tasks for an occupation, the employee is only asked to recognize each task, and not have to try and recall each work activity. Recognition is far faster and more complete than is recall.

c. Answers to each task statement need to be given simply by circling a number or by checking an item.

5. *Assurance of Confidentiality*

There should be no penalty possible for giving an honest answer, or for refusing to answer a particular item (or even the whole questionnaire, if that should occur). In no way should the respondent's higher management levels be informed that a person "failed to cooperate." Even the nature of the individual answers should be kept confidential; in no way should they serve to embarrass or harass the respondents.

To help accomplish this, the completed questionnaire should be placed in the large manilla envelope provided, and sealed by the respondent. The sealed envelope should then be returned in accordance with local plans. It is doubtful that the questionnaire seeks any sensitive information, but the caution seems useful to assure that we do not inadvertently create a problem.

6. *Assurance of Voluntary Participation*

Each employee always has the right to refuse to answer a particular item on the questionnaire. Please be sure to inform each one of this option, but do so in a way that does not encourage them to omit answers very often. Discretely tell them of their right, but stress the survey need for their experienced judgments.

7. *Spot Checks to Assure Compliance with Administration Requirements*

If you use persons from other agencies to administer the questionnaires, it might be useful to perform a spot check occasionally with cooperating firms and/or employees. This could provide assurance that the questionnaires were in fact administered to appropriate employees. By asking such questions as "how long did it take for an employee to complete the questionnaire?" it may be possible to assess the likelihood that the questionnaires are being administered properly.

8. *Procedures for Employees to Return Completed Questionnaires*

On the first and last pages of each booklet, each person is told to put all completed materials in the large manilla envelope, and to seal it. Then to turn it in according to local instructions. These local instructions are the responsibility of each administering agency. You should work out these instructions as they fit your situation. Perhaps a responsible official within each firm could be appointed to receive the sealed envelopes, and to follow-up on any that are not turned in. Or, they may be collected on the spot by you or your representative. Or, they may be mailed directly to your office. In this latter case it would be appropriate to put your address on the envelopes and to prestamp them. The basic intent is that no one in the firm should have access to specific responses by which the respondent could subsequently be harassed or embarrassed.

9. *Review of Completed Questionnaires*

As sealed envelopes are recieved from employees, there is a need for you to open each and check that the questions have in fact been answered. The following guidelines are suggested for doing this review and for responding to discrepancies:

a. Scan each answer section, including the Background Information page, to determine whether answers were generally given appropriately to all tasks listed.

Figure 18 – Continued

b. If it appears that the employee chose not to provide a reasonably complete set of answers, either contact that person again and try to get continued effort on it, or find a person in a comparable type of firm to complete another questionnaire. Additional questionnaires are included for this purpose. Please note any such changes on your Agency Worksheet.

c. If the answers are complete but nonsensical garbage, accept them without comment. Note your evaluation on the outside of the envelope and on your Agency Worksheet. (Do not convey this information to the employer.) Then, contact a person in some comparable type of agency to obtain a complete and meaningful set of responses.

10. *Extra Questionnaires*

Some additional copies of the TIQ are included with the materials sent to you. These do not have prestamped identification numbers. These can be used or distributed at your discretion. Please return any unwanted ones to us. If more are needed, please phone us collect.

If additional copies are used to obtain employee responses, please be sure to *put an appropriate identification number on the cover* of each set used, and record this number on the Agency Worksheet.

11. *Completion of the Agency Worksheet*

In the package of materials sent to you is a form labeled Agency Worksheet. The last column is for your local use as you see fit. The first column provides the identification number for each questionnaire respondent. The balance of the worksheet should be used to provide us with the following information on each respondent:

a. *Size of the Operation.* This column is to be used to record the size of business operation in which each responding employee works. Indicate whether that business operation is large, moderate, or small in size. This size indication is judgmental on your part, but you might consider it large if there are more than 20 employees working in the immediate area, and as small if there are less than 5 such workers. Thus, it is the size of the occupational function in one location that is noted; not the size of the employing agency nor of the parent company.

b. *Metropolitan Area and State.* The general location of the employment setting should be recorded for each respondent. Exact city is not important, as long as the metropolitan area is named. This is more for regional identification than for pinpointing work sites. However, if the location is a rural or isolated one, this should be noted.

c. *Cautions.* Tell us of any particular incidents or conditions that occurred that might create problems interpreting the questionnaire responses. This information possibly could be important in properly analyzing the questionnaire results.

12. *Feedback on Problems Encountered*

It is most urgently requested that you note any significant problems encountered in administering the questionnaires, and inform us by a memorandum after your work is done. This feedback will help us to assess the need for procedural changes to yield effective and efficient data-gathering processes in the future.

13. *Showing Appreciation to Participants*

a. Each local administrator of these questionnaires may want to indicate specific means of showing appreciation to employers cooperating with this study. Some excellent procedures that have been used in the past have been to send each person a commendatory letter or a printed certificate of appreciation for participating in the study. In one instance these certificates were signed

Figure 18 – Continued

with the name of the state governor. Or, you may have equally good means for using this opportunity to cement relations with employer representatives in your area.

b. If you promise an employer a copy of the results, be sure to get the full correct address to which they should be mailed. We can send them direct to that address when we prepare the report of summary descriptive data. This report would not breakdown the data by employer/city/state/region, but would be a composite from all data locations.

14. *To Return the Completed Questionnaires*

You may mail completed questionnaires back to us as groups of them are completed. These should be addressed as follows:

Name
Title
Address

15. *To Get Paid*

When completed, hopefully within two or three weeks, send your regular agency billing form (or invoice) to:

Name
Title
Address

Indicate it is for the purchase of goods; that is, for so many completed Task Inventory Questionnaires. Also note our Purchase Order number. Payment to you will be initiated promptly, but cannot be done until your invoice is received.

16. *Call for Information or Assistance*

If you have any questions, or need additional help, please phone us collect to discuss the matter:

Phone
Name(s)

17. WE THANK YOU FOR YOUR PARTICIPATION IN THIS SURVEY.

Figure 18 – Continued

AGENCY WORKSHEET

(Please return with completed questionnaires)

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Agency

SURVEY 004

Questionnaire Identification

No.	Job Type	Size of Operation	Metropolitan Area or City	State	Cautions and Comments	Notes
1-2-081	*Programmer*					
1-2-082	*"*					
1-2-083	*"*					
1-2-084	*"*					
2-1-081	*Supervisor*					
2-1-082	*"*					
2-1-083	*"*					
2-1-084	*"*					

Figure 19. Example of agency worksheet.

STEP 15: PREPARE QUESTIONNAIRE BOOKLETS

When all planning and pilot testing has been completed, all revisions made, instructions drafted, and answer sections and background sheets designed, the Task Inventory Questionnaires are ready for printing and binding. Be sure that print size used on the questionnaires is easily readable: suitable for possible older respondents and for use in shop areas which may have inadequate light for reading small print. In estimating the number of all materials to be printed, allow for 15 to 25% more of each form to cover anticipated losses of questionnaires due to faulty response. Also provide for additional "sample" copies for the retention of cooperating employers and associations, as well as the key local administrators.

Assembling each questionnaire. Questionnaire booklets should be assembled in the following sequence:

1. Cover page (see Figure 20)
2. Introduction page (see Figure 21)
3. Background page (see Figures 4 and 5)
4. Instruction page (see Figures 9, 10, 12, 13, and 15)
5. List of tasks and accompanying answer sections (see Figures 11, 14, and 16)
6. Comments section (see Figures 7 and 8)

When the questionnaire booklets are to be mailed directly to respondents, such as in a survey of the membership of a professional or labor association, it is important to have an introductory letter accompany the TIQ booklet. Preferably this should be from the endorsing association, describing the importance and urging members to complete and return the questionnaires.

Instructions for returning the completed questionnaires should be noted conspicuously. If the completed questionnaire booklets are to be mailed back by each respondent, be sure to include a preaddressed and stamped return envelope.

Depending on the questionnaire type selected, the occupational survey booklets for each respondent group would contain the following task questions:

	Task Question	*Type of Response to Question*
Type A		
Booklet for Workers	Significance (Q3)	Circle Number
Booklet for Supervisors	Occurrence (Q2)	Checkmark
Type B		
Booklet for Worker Group 1	Occurrence (Q1)	Checkmark
Booklet for Worker Group 2	Significance (Q3)	Circle Number
Booklet for Supervisors	Occurrence (Q2)	Checkmark

LIST OF ACTIVITIES

OF

BUSINESS DATA PROGRAMMERS

(Form B)
1976

This List of Activities is intended for research purposes. It is not doctrinal or directive in nature, but it is intended to include all activities of any significance which might be performed by most Business Data Programmers as part of their job.

The Task Inventory Questionnaires, of which this List of Activities is a part, is being administered in a research project of

The Center for Vocational Education
The Ohio State University
Columbus, OH 43210

In collaboration with eight state curriculum laboratories and vocational research agencies throughout the nation.

Figure 20. Example of a cover for TIQ booklet.

TASK INVENTORY QUESTIONNAIRE

Introduction

You are requested to participate in providing information about the job of Business Data Programmers. In combination with the responses of many other experienced workers and supervisors, your answers to questions on the Task Inventory Questionnaire will help determine very specifically what job activities now are part of the work of Business Data Programmers.

As an individual experienced with the day-to-day functions and work requirements of Business Data Programmers, either as a worker or as a supervisor, your assistance is most essential. You are asked to provide some of the detailed information that is necessary to systematically identify the performance content of the occupation as it occurs in different employment settings. This will make it possible to plan more useful and realistic training programs and occupational descriptions.

Should there be any particular items you prefer not to answer, you are certainly free to omit those items. However, your consideration of each of these items is most important to the effective accomplishment of this occupational study. We need your judgments and knowledge of the work situation as it actually exists. Please base your answers on your own experience with the work done by a Business Data Programmer. Composites of a larger number of responses from all over the country will be used; the answers of any one person will never be reported. Thus, your participation will serve to provide a representative sample of the work as it occurs nationwide.

Most of the activities (or tasks) performed by Business Data Programmers are listed in this booklet. While not all Business Data Programmers will do all these activities, this listing should include nearly all of the job activities performed by any one person. If you note that some activities are missing from the listing, please write them in this booklet or on a separate paper. Turn in these additions along with your completed questionnaire booklet.

Two questions accompany this booklet. You are asked to answer both questions. Please work on one question at a time, finishing it before starting on the next question. (This paragraph applicable only to Types H, I, and J.)

When finished with the task questions, please place this List of Activities booklet in the accompanying manilla envelope. Be sure you have also answered the Background Information Sheet and the section for your comments and suggestions. Seal the envelope, and turn it in according to directions given you locally.

THANK YOU FOR YOUR COOPERATION.

Figure 21. Example of introduction page for questionnaire respondents.

	Task Question	*Type of Response to Question*
Type C		
Booklet for Worker Group 1	Occurrence (Q1)	Checkmark
Booklet for Worker Group 2	Significance (Q3)	Circle Number
Type D		
Booklet for Workers	Occurrence (Q1)	Checkmark
Booklet for Supervisor Group 1	Occurrence (Q2)	Checkmark
Booklet for Supervisor Group 2	Significance (Q4)	Circle Number
Type E		
Booklet for Workers	Occurrence (Q1)	Checkmark
Booklet for Supervisors	Significance (Q4)	Circle Number
Type F		
Booklet for Workers	Significance (Q3)	Circle Number
Type G		
Booklet for Workers	Significance (Q3)	Circle Number
Booklet for Supervisors	Occurrence (Q2)	Checkmark
Type H		
Booklet for Worker Group 1	Occurrence (Q1) *and* Time Spent (Q5)	Checkmark *and* Write Number
Booklet for Worker Group 2	Significance (Q3)	Circle Number
Type I		
Booklet for Workers	Occurrence (Q1) *and* Time Spent (Q5)	Checkmark *and* Write Number
Booklet for Supervisors	Significance (Q4)	Circle Number
Type J		
Booklet for Workers	Occurrence (Q1) *and* Time Spent (Q5)	Checkmark *and* Write Number

Later storing and referencing of questionnaires can be facilitated by using a different colored stock for the cover of booklets for each different occupation, when more than one occupation is to be surveyed.

Coding each questionnaire. To relate each completed questionnaire to the type of respondent and employment situation intended, it is useful to stamp or write a unique code identification number on the outside of each TIQ booklet. These numbers also should be recorded on the Agency Worksheets for further assurance that such background information can be associated with the proper respondents. This numbering is not intended to personally identify the individual respondents, but serve only to facilitate data processing and accounting for questionnaires assigned to each administrator.

The suggested coding system is one that will be compatible with the data card keypunching system to be used in Step 17. It consists of a likely maximum of 10 digits (Table 2). Five digits may suffice for small one-time surveys: one card column each for kind of respondent, response group, and administrator, plus two columns for individuals when less than 100 are used per group.

Table 2

10-Digit Identifying Code for TIQ Booklets

Card Column(s)	Row Definition for Column(s)
1, 2, & 3	*Occupation, Area, or Function Being Surveyed* (allowing up to 999 surveys)
4	*Type of Survey Respondent:* Row 1 – Worker in the Occupation, Area, or Function Row 2 – Immediate Supervisor of Workers in Occupation
5	*Response Group Within Respondent Type:* Row 1 – Group 1 Row 2 – Group 2 (etc., allowing for up to nine groups)
6, 7, & 8	*Individual Respondent* (yielding a unique code for each booklet, when used in conjunction with first 5 digits; allowing up to 999 respondents per occupation and respondent type/group)
9 & 10	*Key Individual or Agency Administering the Questionnaire* (allowing up to 99 administrators per survey)

This identifying number can be displayed for ease of reading by use of hyphens separating the major columnar definitions, such as:

004-1-2-081-12

This would denote the fourth occupation surveyed, administered to person 81 in worker group 2 by individual or agency 12.

A record should be kept of the places and persons to whom copies of the Task Inventory Questionnaire are sent. If mailed direct to workers, then their names and addresses should be recorded. If distributed to local administrators, then there should be a record of which types of questionnaire and intended respondents were included, as well as the identifying numbers involved.

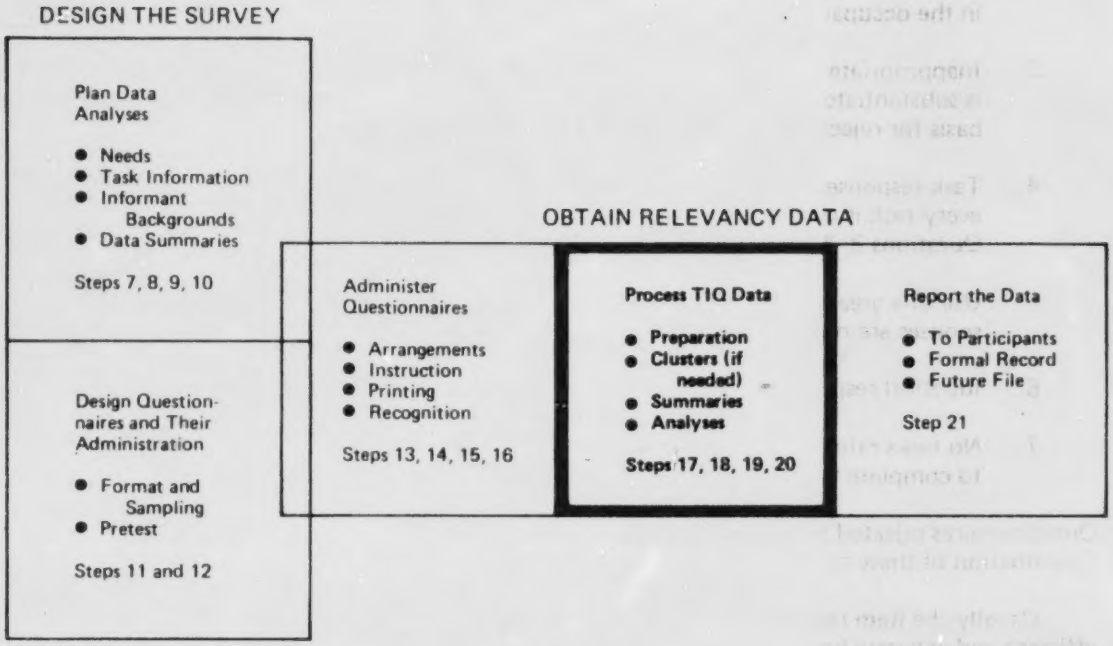
Similarly, a record should be maintained of the questionnaires received from respondents or administrators. Keeping these records together will make it easy to detect delays in returns and to initiate follow-up efforts as may be suitable. At any time it should be possible to calculate the percentage of returns of completed questionnaires.

STEP 16: ACKNOWLEDGE COOPERATION OF AGENCIES AND PERSONNEL

Soon after the completion of a survey administration it is highly recommended that each participating agency and individual receive a letter or other notice of appreciation. Local administrators should do this with their employers and employees. The survey sponsor or planner should do this with their key local administrators, and give recognition and credit in subsequent reports of the survey data to the essential part played by this cooperating network of administrators.

In addition, a number of employers definitely expect to receive at least some brief summary of results for their participation. The appropriate content of such feedback reports will vary from survey to survey, but ideally should formally document the descriptive data and results of analyses. Since such a report usually consumes quite a bit of time before it is ready for distribution, and may be costly, it usually is best to prepare a short description of key results. This serves as quick reading and permits the participating employers to sense that their efforts were valuable and appreciated. By such means it is intended to maintain the goodwill of such employers, encouraging them to be cooperative with any future survey needs or other contacts. This feedback can also alert them to the availability of the subsequent report, or of any previous surveys.

ACTIVITY F: PROCESSING SURVEY DATA



The procedural steps in Activity F involve the processing of survey data, upon receipt of the completed Task Inventory Questionnaires that were administered by the efforts in the preceding Activity E. Four possible steps are described here, though specific elements of these steps are dependent upon the particular plans devised in the earlier Activity D:

- Step 17: Prepare Questionnaire Responses for Processing
- Step 18: Cluster Workers Into Job Types
- Step 19: Compute Summary Descriptive Data
- Step 20: Perform Analyses of the Survey Data

STEP 17: PREPARE QUESTIONNAIRE RESPONSES FOR PROCESSING

Audit of each booklet. When questionnaire booklets are received, they should be scanned for completeness and for compliance with the directions prior to keypunching. Those evidencing major

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obvious failures of respondents to follow the questionnaire directions should be rejected from further use in the survey. Rejections may be based on such evidence as:

1. Highly inconsistent and incomplete responses.

2. Supervisor apparently rating his own job as supervisor, not the performance of workers in the occupation.

3. Inappropriate respondent, as when background sheet notes an alternate job title and this is substantiated by the overall pattern of task responses. (Job title should not be the sole basis for rejection, since many inconsistencies exist for titles in practice.)

4. Task responses within a questionnaire fail to show item discrimination, such as when every task is checked on Question 1 or 2, or all are rated at the same scale level on Questions 3, 4, or 5.

5. Use of a great many multiple responses per task on Questions 3, 4, or 5 (multiple responses are not usable by the computer routine).

6. Identical response patterns from all workers in one participating shop or office.

7. No tasks rated after the first few pages of a booklet, indicating the respondent chose not to complete the questionnaire.

Questionnaires rejected should be noted and recorded, along with the reasons for their rejection. Examination of these may provide clues to improvements needed in future surveys.

Usually the item responses can be keypunched directly from the questionnaire booklets. For efficient and accurate keypunching, keypunch operators should not be required to edit or interpret the data. Consequently, scanning for completeness should also include the clarification of illegible responses. Legibly marking correct item responses with a red pencil will help the keypunch operator, without destroying the original marking if later someone wants to use it.

Data coding for keypunching. Instructions for the coding of responses are provided in Volume 5, with only a brief summary of salient features given here. Using the respondent identifying number as the first 10 digits of each card prepared for a questionnaire, Columns 11 and 12 identify the specific question for which responses are to be keypunched, and Column 13 is used to indicate the card number for that question. The double digit capacity is used for question numbers so that additional questions may be accommodated.

The balance of the card columns are used sequentially to record task responses. These should start on Card 01. Respondent background and reactions should be placed on a separate card, starting with the identifier code. This card may also accommodate the record of equipment items the individual checked as used or operated.

Information from the Agency Worksheet may be included with respondent background data. To permit the size and type of city in which each respondent is employed to be coded, it will be necessary to use an atlas to check location and population. The proper code should then be written in red pencil directly on the background sheet. Keypunch operators can be instructed on which card column to locate this code. Suggested categories of city characteristics and their coding are:

1 Major metropolitan area, including satellite suburbs

2 Moderate-sized city near larger population center

3 Moderate-sized city, but somewhat remote from major population centers

4 Small town

5 Rural or isolated work site

Other categories can be devised to fit the needs of a particular study and its intended scope of interest. If this is done, coding instructions other than those provided in Volume 5 will need to be established for keypunching.

Record of written comments. The background, answers to some tasks, and reaction pages of each booklet, as well as the Agency Worksheet and any accompanying notes, are sources of written information that cannot readily be placed on data processing cards. These sources include (a) background descriptors that are not part of a standardized list, (b) new task statements, (c) comments and suggestions of respondents, and (d) cautions and comments of local administrators. Generally, the simplest approach to recording and organizing these verbal statements is to type them out, using a separate sheet for each class of information. Associated with each statement should be a short version of the identifying number. The individual number (digits 6, 7, and 8) and the agency number (digits 9 and 10) can be omitted. Thus, each comment will essentially be related only to the kind of respondent and the particular group of respondents within that category, if any. If more than one occupation was surveyed, then the comments of workers and supervisors should be grouped by the pertinent occupation. An outline for this clerical recording of verbal statements is presented in Figure 22.

There is no need to record a rating given to a new task added to the list. Since few respondents ever add identical tasks, these ratings are of very uncertain value. It is better to save these tasks for potential inclusion in a subsequent resurvey of the occupation. These additions, or any suggested modifications to listed tasks, can be edited and cited in the formal report of the survey (Step 21). Where a task list was divided into two separate sections to reduce completion time requirements, statements added on one section should be compared with the other section to eliminate tasks already listed and surveyed.

STEP 18: CLUSTER WORKERS INTO JOB TYPES

In those studies where it is desired to identify different types of jobs existing within the work area surveyed, Step 18 is performed prior to any summarizations or other analyses of the task data. This clustering is based upon some selected commonality of task performance. Responses can be used from Questions 1, 3, or 5. However, Question 3 is recommended over Question 1 as the basis for clustering. No recommendation is made at this time between use of Questions 3 or 5.

As previously noted in the Step 11 discussion of selecting respondents, different statistical techniques have varying practical capacities for the number of respondents that can be used in any one application of the technique. In some studies, particularly when using factor analysis as the "clustering" technique, it may be reasonable to divide the respondents randomly into subsets that are within

BACKGROUND INFORMATION

Other Job Titles Given:

Workers		Supervisors	
ID No.	*Statement*	*ID No.*	*Statement*

Other Types of Organizations or Industries Given:

Workers		Supervisors	
ID No.	*Statement*	*ID No.*	*Statement*

Other Sources of Training Given by Workers:

Workers	
ID No.	*Statement*

TASK STATEMENTS

Additions (cite the duty category letter under which each statement was noted):

Workers		Supervisors	
ID No.	*Statement*	*ID No.*	*Statement*

Modifications or Comments on Listed Tasks (cite the task number with each statement):

Workers		Supervisors	
ID No.	*Statement*	*ID No.*	*Statement*

REACTION AND SUGGESTIONS

Workers		Supervisors	
ID No.	*Statement*	*ID No.*	*Statement*

LOCAL ADMINISTRATOR CAUTIONS AND COMMENTS

Specific to Worker Questionnaires:

Specific to Supervisor Questionnaires:

General Issues:

Figure 22. Outline for clerical recording of verbal statements.

the size limitations, and cluster each subset separately. Clusters (factors) of the major job types are likely to appear in each of the respondent subsets.

This section of Volume 3 does not presume to specify one particular procedure for clustering. It will, instead, note several of the methodological issues and suggest several reference sources that should be read before proceding with any attempt to apply a cluster analysis. It is recommended that a statistical specialist be consulted to fit this step to the needs of a particular survey study. The guidelines which follow rely heavily upon issues noted in an article by Fred Borgen and David Weiss (1971). They are intended to outline some of the matters that should be understood and resolved before applying a cluster analysis procedure to the task data of a specific survey of an occupational area.

There seem to be three major areas of concern:

1. Nature of the questionnaire data for each task.

2. Measures of similarity between the task responses of any two workers.

3. Type of clustering analysis to be applied to the measures of similarity between each pair of workers in the survey.

Nature of the questionnaire data. Three kinds of data are possible: dichotomous responses from Question 1, scaled ratings from Question 3, and percentage measures from Question 5. (The process for converting Question 5 ratings to "percent of time" values is presented later in this Step 18 discussion.)

Additionally, the scaled ratings of Question 3 may be transformed from the raw rating to a standard score before applying measures of interworker similarity. It is argued by some that such transformation of raw scores is necessary, to eliminate the effect of differential means and variances of individual raters. Any such transformation will influence the cluster results.

Measures of similarity Any of a wide assortment of measures of response similarity are available, though some clustering techniques are limited to a particular kind of measure. Some of the possible measures of the similarity (of responses to a scaled task question) between a pair of workers are:

- Σd • the sum across all tasks of the scale differences of the raw ratings given by each worker.

- Σd^2 • the sum across all tasks of the squared scale differences of the raw ratings given by each worker.

- ΣXY • the sum across all tasks of the cross products of the raw ratings given by each worker.

- r_{xy} • product-moment correlation between the two sets of ratings of a pair of workers, measuring the extent that variations in one set of ratings match the other set.

- r_t • tetrachoric correlation between two sets of ratings, used when scaled ratings are artificially reduced to two categories, or dichotomous (as may be necessary when the distribution of responses on a scale are highly skewed). Also appropriate for relating responses on Question 1.

Some measures of similarity preserve the component characteristics of profile data (elevation, scatter, and shape) better than others. Borgen and Weiss (1971) indicate that, in examining similarity measures in terms of how much each preserves these characteristics, Cronbach and Gleser (1953)

> concluded that correlation measures, with the exception of intraclass correlation, are generally inferior to distance (difference) measures since they lose information about profile elevation and scatter. Similarity measures which retain all profile components include the sum of the raw cross products and the squared distance (difference) measures (p. 585).

Borgen and Weiss caution that

> It is clear that each of the alternative profile similarity measures tends to have special attributes. An investigator should consider the unique conditions and objectives of his study and choose a similarity measure accordingly (p. 585).

Question 5 ratings (Relative Time Spent) by each worker are to be converted to percentages of total work time spent on each task (Percent of Time Spent) before computing a measure of similarity between two workers. This percentage for each task is calculated by adding all of the Relative Time Spent ratings, dividing each task rating by the total of all ratings, and multiplying the quotient by 100. This yields the percentage of work time spent on each task by each worker in the survey. Tasks not receiving a rating are considered to be rated as "0". The sum of all task percentage values equals 100% for each person. In a like manner, the average Percent of Time values for any group of workers indicate the percentage of group time spent on each task, with the sum of these also equaling 100% (Archer, 1966; Christal, 1974).

Similarity between two workers on Question 5 can be expressed by:

- percentage of common tasks performed.
- total overlapping percentage of time spent on tasks (the preferred option in most clustering studies).

Types of clustering analysis techniques. There are available both "cluster analysis" and "factor analysis" methods by which job types represented within a survey may be derived. All methods begin with a matrix of similarity measures between all possible pairs of questionnaire respondents.

For identifying job types it is usually adequate to apply techniques yielding "nonhierarchical" solutions; that is, simply identifying the discrete homogeneous subgroups of workers (those whose task performance is more similar within the subgroup than with workers in any other subgroup). The tasks and background of workers within a desired subgroup define the nature of that job type. If these subgroups are then clustered, it is possible to group them into "superclusters" or higher order groupings of workers. This is termed a "hierarchical" solution, useful when there is interest in the relationships among the clusters or job types (Johnson, 1967).

Examples of the more tested and readily available methods are:

☐ *Transposed Factor Analysis*

> This is a special application of factor analysis variously known as inverse factor analysis, Q technique, or transposed factor analysis. It identifies clusters of raters (workers) rather

than clusters of items rated (tasks) as is conventional in most factor analysis studies. This is done by starting with measures of similarity between pairs of raters across all tasks instead of between pairs of tasks across all raters. Computer programs for factor analysis are widely available among university computer centers. Any of a variety of similarity measures can be used, though correlations are most typical.

☐ *CODAP's GROUP Program*

This program package within the CODAP system of the U.S. Air Force is a clustering procedure that uses an iterative grouping technique called "collapsing the matrix." It involves repeated searching for those individuals or partially formed clusters which have the highest remaining similarity. A printout is produced of the tasks performed by individuals in each cluster. A companion program package can be used to determine the characteristics and locations of individuals working in each job type or cluster. Similarity measures must be in the form of percentages.

☐ *Ward's Hierarchical Grouping Analysis*

Applicable to many different kinds of similarity measures, Joe Ward's (1963) method forms hierarchical clusters having minimum within-group variation and maximum between-group variation at each successive stage of the grouping process. Though capable of hierarchical solution, it can also determine a fixed set of clusters, the appropriate number of clusters being selected with the help of an index of error at each grouping stage. It is also called the MAXOF Clustering Model from the concept of *MAX*imizing an *O*bjective *F*unction. Veldman (1967, Chapter 12) discusses the method and presents a FORTRAN program and sample output. Ward also reports a general purpose grouping routine, identified as *Group 4* of the PERSUB Subroutine System (Ward, Buchhorn, & Hall, 1967; Ward, Hall, & Buchhorn, 1967).

☐ *Tryon's Methods for Cluster Analysis*

A sequence of increasingly more advanced clustering approaches were developed by Robert Tryon (Fruchter, 1954; Tryon, 1959, 1967; Tryon & Bailey, 1970). The approach described in Fruchter involved some judgmental decisions. The 1959 report of the Cumulative Commonality Cluster Analysis sought to develop wholly statistical criteria to replace such judgments. Earlier methods were constructed for manual analysis; later methods were adapted or constructed for computer application.

Cluster analysis provides discrete, categorical placement of workers into one particular grouping of persons doing similar tasks. Factor analysis, on the other hand, weights the extent to which each worker's task performance is related to each of the derived groupings. If a worker has a high factor loading in only one grouping, there is no difficulty in knowing to which grouping he belongs. However, more typically a worker will have a sizable loading in more than one grouping, indicating that worker's task performance is similar to two or more of the groupings. This makes it difficult or impossible to assign each survey respondent to one particular job type, though it is still reasonable to interpret and describe each grouping or job type.

To provide a more thorough understanding of clustering techniques, the reader is particularly encouraged to reference Borgen and Weiss (1971), Tryon and Bailey (1970), Veldman (1967), Weiss (1976), and Yshort (n.d.).

Interpretation of clusters. Ideally, there should be a clear, explicit, and intuitively accurate description of the job type expressed by each cluster or grouping. The clusters should be meaningful groupings of workers doing comparable assignments.

To provide such interpretations, obtain the job title, experience, industry location, equipment used, and other available background information for workers in each cluster (or loading high on a factor). Also, examine the distinguishing high-versus-low significant tasks (Question 3 or 4) for workers in each cluster. Patterns of backgrounds and tasks should become apparent. These patterns convey the nature of work done, and by whom, that characterize a cluster. From such a pattern, and its differences from patterns of other clusters, it should be reasonable to generate a label that effectively names the job types.

STEP 19: COMPUTE SUMMARY DESCRIPTIVE DATA

This step assumes that specific occupations have been identified, either by selection (Step 1), by respondent background (Step 9), or by analysis of worker clusters (Step 18). Then, for workers within a particular occupation, responses to each task are summarized to reflect that group's description of their work. Similarly, ratings focused on such workers by supervisors are to be summarized separately to reflect as a group their view of expected job performance.

As noted earlier in the design stage (Step 10), these response summaries for each task can take the form of average ratings, measures of dispersion of those ratings, frequency distributions, and/or percentages of various types of responses. Computers are ideal for computing these summaries, allowing at the same time for comparisons to be made between the task summaries of different kinds of respondents.

Volume 5 provides one computer program for summarizing task data and displaying the results as noted in Tables 1 and 2. But a variety of other computer packages now exist for doing comparable data processing. The SOUPAC program developed recently at the University of Illinois (1974) and widely distributed, has this capacity (using the MATRIX and TRANSFORMATIONS routines to set up the data, the STANDARD SCORES routine for means and standard deviations, and the CORRELATION routine for measures of relationship between responses by any two groups of respondents). And, a recent announcement (Knox, 1976) by the U.S. Department of Commerce's National Technical Information Service (NTIS) indicates their new CENTS-AID II program package is an efficient process available for purchase. Incidentally, most systems can also produce printouts on plain rather than lined paper. This feature provides camera-ready copy for use in printing reports of survey results (Step 21) without retyping the data summaries.

In addition to the descriptive task data, several other computations can be made to characterize the survey population and their response to the survey:

- Frequency distribution of responses on standardized categories for each background question, effectively tallying the use of each category of response.
- Summarization of ratings on each reaction statement, to note relative perceived merits of different aspects of the questionnaire associated with a particular occupation.
- Average number of tasks cited as some part of the job by workers, and by supervisors.

- Distribution of responses to each scale category for Questions 3, 4, and 5, as summed over all tasks and all respondents in a particular group.

These additional descriptive results can be reported along with the formal documentation of task data summaries (Step 21).

STEP 20: PERFORM ANALYSES OF THE SURVEY DATA

After group summary data are available (Step 19), a number of different analyses can be performed on that data. Some are appropriately applied to a single occupation, others are appropriate when more than one occupation was surveyed. Figure 23 notes a number of useful kinds of analyses using respondent background and task relevancy data. These are differentiated in the figure as to whether they are applicable to single or multiple surveys. Each is discussed separately below.

Interrater reliability. Scaled questions such as Questions 3, 4, and 5 can be analyzed to measure the extent to which the raters within a group provided reliable responses on that question. Interrater reliability for each question may be calculated by an analysis of variance procedure (Winer, 1971, pp. 283-296) which yields a measure of the degree of agreement within a group of raters. This measure can also be adjusted for differences in each rater's frame of reference (mean rating of individual, as compared to mean rating for composite of all raters). This adjustment produces a reliability measure free of any source of variance due to individual differences in such frames of reference.

Many university computer systems have existing programs for this analysis.

FOR A SINGLE OCCUPATION
• Interrater Reliability • Relationships Between Task Questions • Task Performance by One Particular Subgroup of Workers • Subgroup Comparisons: Based on Different Backgrounds of Respondents Differences Between Worker and Supervisor Responses • Assessment of Task Relevancy to an Occupation • Composite Job Descriptions
FOR COMPARISONS BETWEEN OCCUPATIONS
• Background Differences • Overlap of Tasks • Key Distinctions Between Occupations

Figure 23. Possible analyses using background and relevancy data.

Relationships between task questions. The relation between two different task questions can be measured by computing the correlation between their respective arrays of summary responses. Correlational computations can be handled routinely by most any university computer center, and are a component of a number of widely available program packages.

Task performance by one particular subgroup of workers. With a sufficiently high number of respondents to yield stable subgroups of worker types, some interesting and useful descriptions of task performance can be prepared for a particular selected subgroup. For example, one might wish to see a description of the tasks most performed by workers in a given part of the country who operate a particular type of equipment, and who have been on the job for two years or less. A description like this can be prepared for any group of workers as long as they can be defined in terms of information in the background section of the questionnaire.

Subgroup comparisons based on different backgrounds of respondents. Again with a sufficient number of respondents, comparisons between subgroups of respondents with regard to task occurrence or significance can provide interesting clues for training or manpower requirements. A comparison of tasks performed by experienced workers with those performed by newcomers to a job may provide useful insights about the needed content of multilevel training programs.

A distribution of task occurrence or significance in terms of the primary kind of training initially received (Figure 6) can also be determined. Thus, it might be desired to determine if persons trained on the job tended to perform different tasks than persons who received more formal training. If there were a definite difference, possible changes might be considered in the content of training, either on the job or in formal school programs.

As the reader will recognize, a variety of such analyses are possible, depending on the background data and the number of survey respondents available having each type of background. However, no direct comparison of subgroups is possible unless specific items of background information are obtained in the survey. It is for this reason that importance is attached to preplanning in Steps 9 and 11.

Differences between worker and supervisor responses. As previously noted in Table 1 (Step 10), it is possible to compute and display the difference between the average task responses of workers and supervisors. The same would be possible for Questions 3 and 4, except none of the questionnaire types (Figure 2) administer these two questions simultaneously.

When there is a large discrepancy between worker and supervisor response on Questions 1 and 2, this suggests where there may be real differences in perceptions and expectations. Differences should be relatively large, generally of an order of 20% or more (such as when 25% of the workers check the task as done, but 50% of the supervisors expect workers to do it).

Such differences warrant further examination to establish the reason for each deviation and its meaningfulness for the purposes of the survey. Questions 3 and 4 answered by different persons than responded to Questions 1 and 2, can be used to provide some interpretation where large occurrence differences exist for a task. For instance, the discrepancy may be on a task of only small-to-moderate significance. The task statement itself should be examined for clues to the nature or cause of any differences between group responses. Very few major differences are to be expected in a survey of workers and supervisors, when task questions are asked at a broad level of job awareness. Additional information to aid in these interpretations is provided when the task questions of Volume 4 are added to the Task Inventory Questionnaire. Discussion of these instances is contained in Volume 4.

Tables pointing out summary data for Questions 1 and 3 provide a means for comparing differences in responses to those two questions. However, those two questions are not directly comparable. The "0" rating on Question 3 is not used by workers the same way as "not checking a task" on Question 1. Apparently workers tend to use scale levels of 1, 2, and even 3 on Question 3 to anticipate tasks they *might* be called upon to perform.

Assessment of task relevancy to an occupation. The procedure in Volume 2 for listing tasks is to include them if there is any doubt of their relevancy, and subsequently to use survey data to measure the extent to which each task is relevant. It can then be anticipated that some of the tasks will be determined not to be relevant to the occupation surveyed, and some will be only peripherally relevant, with only a few workers doing and expected to do such tasks.

For determining the minimum point at which a task can be ruled as relevant to the occupation, consider only those tasks which are marked as performed or part of the job by more persons than might be expected to mark in error. About 10% of the responses to a task can be considered within that margin of marking error.

The general rule for using survey data in establishing a task's relevance to an occupation is suggested as:

> Reject a task as being definitely not relevant when less than 10% of the workers indicated on Question 1 that they performed it *and* less than 15% of the supervisors indicated on Question 2 that such workers should perform the task.

The values for this rule, which uses questions from *survey Types B and D* (Step 8), can be displayed as follows:

▶ Question 1 $< 10.0\%$ (*and*) Question 2 $< 15.0\%$

The higher supervisor percentage accommodates a tendency for supervisors to rate a greater number of tasks as part of the job, since they are judging a group of workers, rather than the assignment of one individual worker.

Reasonably comparable rule values for the other survey types (per Step 8), using summary descriptive data for each task (as determined in Step 10), are as follows:

Type C

▶ Question 1 $< 10.0\%$ (*and*) Question 3 Mean < 0.75

Type E

▶ Question 1 $< 10.0\%$ (*and*) Question 4 Mean < 0.75

Type A

▶ Question 3 Mean < 0.75 (*and*) Question 2 $< 15.0\%$

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These rule values can be applied quite readily by hand when computer printout tables such as those shown in Tables A-2 and A-3 of Volume 5 are prepared. These tables summarize the task responses to Questions 1 and 2 (Occurrence) by 10% intervals of the percent performing or desiring performance of each task. Or, in Volume 4, specific computer routines are cited, along with routines for other rules used in selecting for training the more critical tasks of an occupation.

Values assigned to each rule are somewhat arbitrary. The values suggested here have been found to be meaningful and effective for occupations in which a typical worker currently performs about one-third to one-half of the tasks which are relevant to that occupation. This seems to be a situation common to many occupations.

There are exceptions, however. Some occupations can be highly prescribed, such that nearly all workers perform a high proportion of the same tasks. This can occur, for example, within a single large employing firm where workers are bound by a set of directives detailing what work is to be done by those employees (such as safety inspectors, guards, bookkeepers).

A difficulty arises when one large part of a job is fixed by directives, but the remaining portion is flexible to vary from one work situation to another. This can happen, for instance, in leadership jobs which also involve technical operation of complex equipment. The technical operation portion of the task list may be separated from the leadership portions, with different rule values then applied to each portion. The governing consideration is that the result of the rule applications should make good sense to persons knowledgeable about that occupation. A few such individuals should be asked to review the tasks ruled relevant and nonrelevant, and express their views on any specific tasks which appear to be inappropriately classified.

Composite job descriptions. Given a determination of which of the tasks listed in a Task Inventory Questionnaire are relevant to some degree, these can be listed separately for the particular occupation. A useful system is to list them in rank order within each duty category, based on the responses to Question 1 or Question 3. Associated with each task statement can be cited the summary descriptive data from each of the questions used. This yields an overview of the occupation which can be quickly scanned for information on tasks of high relevance. Figure 24 illustrates in abbreviated form what such a job description might look like.

When several occupations within an area were surveyed, separate listings of relevant tasks for each occupation should be prepared. A good example of this is outlined in a study by Berger (1974) in his survey of tasks performed by computer programmers. In that instance there were three programming areas which defined different programming occupations. Additionally, three career levels were based on length of experience and job title, differentiating between effectively distinct job types within each programming area. Berger presented a schematic representation of the sets of job descriptions appropriate to that occupational area:

	Programming Areas		
Job Levels	Business/ Commercial	Scientific & Engineering	Systems (Software)
Junior or Entry-Level			
Programmer			
Senior Programmer			

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	TASKS OF AUTOMOTIVE MECHANICS	Workers, Percent Performing (Question 1)	Supervisors, Percent Expecting Performance (Question 2)	Workers, Extent Task Is Part of the Position (Question 3)	
				Mean Rating	Percent Rating It at Least a Substantial Part of Job
DUTY C:	ENGINE OVERHAUL ACTIVITIES				
117.	Adjust valves.	92%	100%	4.3	66%
155.	Repair or service crankcase ventilation system.	92%	99%	4.4	65%
160.	Run compression test.	92%	100%	5.3	85%
132.	Perform operational inspection of positive crankcase ventilation system.	90%	97%	4.4	70%
140.	Replace engine mounts.	90%	99%	4.5	75%
120.	Diagnose valve train and head malfunctions.	88%	96%	4.5	68%
125.	Inspect exhaust systems.	88%	100%	5.0	86%
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
154.	Replace valve seats.	38%	46%	1.4	13%
129.	Machine valve guides for special seals.	35%	55%	1.8	21%
135.	Rebuild rocker boxes.	22%	38%	1.4	18%
134.	Rebuild cam followers.	18%	30%	0.9	12%
161.	Weld small holes and cracks in blocks.	18%	20%	0.4	3%
DUTY D:	MAINTAINING AND REPAIRING POWER TRAINS				
162.	Adjust external shift linkage on manual transmissions.	93%	99%	4.0	62%
163.	Adjust mechanical-type clutch.	93%	99%	4.4	68%
169.	Lubricate speedometer cable, drive gear, and housing.	92%	99%	4.0	65%
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
174.	Rebuild overdrive unit.	37%	50%	1.3	15%
165.	Balance drive shaft (in-car).	27%	31%	0.9	12%
193.	Straighten rear housing to correct excessive tire wear.	12%	24%	1.1	13%
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.

Figure 24. Abbreviated example of a job description of tasks for an occupation.

Each of the nine resulting job descriptions separately summarized an occupation or job type. Some tasks appeared in several or all nine descriptions; others occurred in only one or two of them, as tasks judged not relevant to an occupation were omitted from that particular listing.

Berger (1974) also defined five different types of job descriptions:

1. Universal.
2. Ideal.
3. As-Practiced.
4. Specific Focus.
5. Organizational.

Each of these types may be of especial utility for various purposes of work management, career counseling, training curriculum content, establishment of professional or craft membership standards, evaluation of worker performance, or employment selection. In the context of Volume 3, these five types of job descriptions would be defined as follows:

- ☐ UNIVERSAL JOB DESCRIPTION: Composite of tasks judged as relevant to an occupation by *both* workers and supervisors, such as determined by relevancy rules noted earlier.

- ☐ IDEAL JOB DESCRIPTION: Comprised of tasks judged as relevant by only the supervisors, using Question 2 and/or Question 4.

- ☐ AS-PRACTICED JOB DESCRIPTION: Comprised of tasks judged as relevant by only the workers, using Question 1 and/or Question 3.

- ☐ SPECIFIC FOCUS JOB DESCRIPTION: Similar to the As-Practiced description, but focusing on task performance of a subgroup of workers. Selecting some element of background information (such as length of experience, type of training received, type of main equipment operated), a separate description of performance can be prepared for a specific subgroup of workers.

- ☐ ORGANIZATIONAL JOB DESCRIPTION: A localized description of any of the other types, but limited to task responses from within a particular organization. This description would reflect the relevancy of tasks as the occupation serves the mission and with the resources of a specific employing firm. It is especially useful to an organization wishing to tailor a job description to its own unique requirements, yet retain a capacity to compare its situation with the general field of employment for an occupation. Such comparisons could be useful in helping to identify tasks for which postemployment training is warranted for new employees, whether from an occupational training program or from other employing organizations.

Occupational comparisons based on worker backgrounds. Data from the background responses of workers can be summarized separately for each complete occupation or job type surveyed. These summaries, when compared, yield evidence of similarities and differences of workers in these occupations. Such comparison could be based on any or all of such matters as:

1. Average length of work experience.

2. Lengths of work experience of the middle 50% of the workers in each occupation (that is, the semi-interquartile range of experience years cited by those workers, omitting the 25% having the least experience and the 25% having the most experience).

3. Primary sources of occupational training.

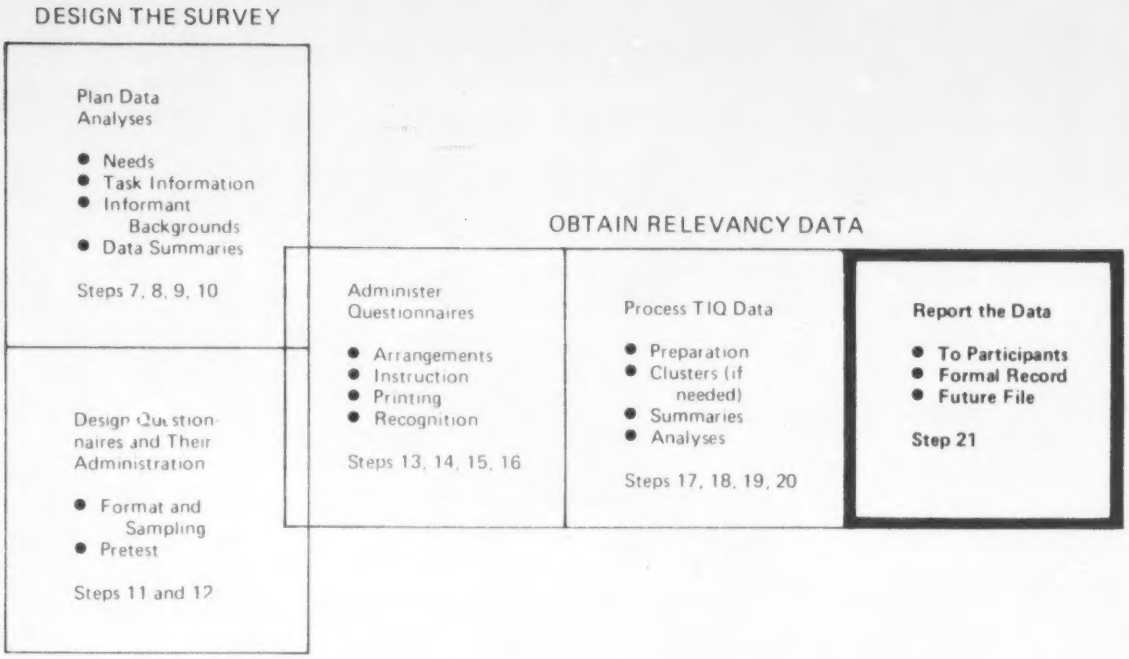
4. Types of industry where employment predominates.

5. Major types of equipment operated, used, or maintained.

Occupational comparisons based on overlaps of tasks performed. Taking the separate job descriptions described earlier, it is possible to note where completely different tasks are performed in different job types, and their relative significance to each job. Similarly, where the same tasks are performed in different jobs, major differences in significance or percent performing can also be noted.

Occupational comparisons noting key distinctions differentiating jobs. Examining only those tasks with reasonably high levels of significance or job occurrence from the overlap comparisons above, estimates of the task performance characteristics that differentiate between those jobs can be obtained. This examination will help identify those tasks most representative of a job or job cluster, distinguishing that job from related jobs.

ACTIVITY G: REPORTING THE SURVEY RESULTS



STEP 21: PREPARE REPORTS OF DESCRIPTIONS AND ANALYSES

In addition to whatever internal reports are appropriate, it is also recommended that several other reports be prepared, if not already included in the internal report system. These additional reports are for the purpose of sharing the survey results with others.

Feedback of results to survey participants. While it may not be feasible to communicate with each questionnaire respondent, it is an expected courtesy to provide a short or popular description of selected survey results to participating employers, associations, and key local administrators. This need not be a large or fancy printing, but a gesture of appreciation for their valued assistance. This feedback report should be prepared and distributed soon after the survey administration is completed, when some meaningful results can be communicated. Portions of the analyses could be reported to the membership of pertinent professional and labor associations through their periodicals and newsletters.

Formal documentation of descriptive summary data. A report of the survey effort and summary data on tasks of an occupation should be prepared to share these results with others outside the agency sponsoring the survey, whenever such sharing is within the policy of that agency. This report should describe the procedures that were used in developing and administering the questionnaire and the descriptive findings that were obtained. Such a report provides a permanent and dated record of the effort and can also aid others in their efforts to construct and analyze Task Inventory Questionnaires.

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A suggested outline of the formal report is as follows:

Introduction

A. Purpose of the Survey
B. Definition of the Scope of Occupational Interest
C. Definition of Key Terms Used

Methodology

A. Construction of the List of Tasks
B. Characteristics of the Samples of Workers and Supervisors (types, locations, industries, experience levels)
C. Data Collection Procedures (methods, dates)
D. Analyses Performed (basis on which relevance was established)

Description of Specific Jobs

A. List of Relevant Tasks (validation of task inventory)
B. Summary Task Data
C. Tasks Added by Respondents

Description of Respondents

A. Background Characteristics
B. Equipment Usage

Analyses

A. Scale Usage and Interrater Reliabilities
B. Other Analyses as Available and Reportable

Implications of Findings

It is recommended that the report employ the writing and format style as established by the *Publication manual* of the American Psychological Association (1974). The publication style of this manual has been adopted by over 120 journals and periodicals in the fields of education, psychology, guidance, and other social sciences. By its use, portions of the report could become readily convertible to articles in such journals, and not require the preparation of the material by two different style guides.

For sharing the report with others, the following document clearinghouses and repositories are suggested, along with others that may be known in particular occupational fields or by sponsoring organizations.

ERIC Clearinghouse on Career Education
The Center for Vocational Education
1960 Kenny Road
Columbus, OH 43210

(operated under the sponsorship of the National Institute of Education, HEW, for documents in the areas of adult-continuing, career, and vocational-technical education)

- Task Inventory Exchange (TIE)
  The Center for Vocational Education
  1960 Kenny Road
  Columbus, OH 43210

  (operated as a service to education, government, and industry to promote the sharing of task inventories and related methodologies, providing one-copy reproductions at cost on request where copying permission has been obtained)

- National Technical Information Service (NTIS)
  U.S. Department of Commerce
  5285 Port Royal Road
  Springfield, VA 22161

  (a central source for the public sale of Government-sponsored research, development, and engineering reports and other analyses prepared by Federal agencies or by their contractors or grantees)

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APPENDIX

SOME OTHER POSSIBLE TASK - RELEVANCY QUESTIONS

These additional task questions are cited here only for their potential value to the user of this volume in special circumstances and needs that might be encountered, such as when additional performance variables are desired to enhance an occupational description. These other task questions are not part of the process generally recommended in this volume, and no further description is made of them. However, data could be processed in a fashion comparable to the methods cited in Step 19, Compute Summary Data. Though no specific recommendation is made for their use in establishing job relevancy, for the readers' information these other task questions include those pertaining to:

1. How often each task is done.
2. How important is each task.
3. Performance time.

PERTAINING TO HOW OFTEN EACH TASK IS DONE

- Actual Frequency of Performance (asked of workers)

  Within the last year or so in your present job position, about *how often* have you been performing each activity done by you (as checked in Question 1)?

  Response Scale and Abbreviated Questionnaire Symbols:

  0+ Normally not performed, but *have* done so in a very special or unusual circumstance.

  Y- Perform the activity, but much less often than once a year.

  1Y Perform the activity about once a YEAR on the average (but not as often as once a month).

  1M Perform the activity about once a MONTH on the average (but not as often as once a week).

  1W Perform the activity about once a WEEK on the average (but not as often as once a day).

1D Perform the activity about once a DAY on the average.

D+ Perform the activity several times each work day.

Reference: Ammerman & Pratzner, 1974.
This corresponds to Question 10 for which the computer program of Volume 5 calculates summary values.

- Frequency of Task Performance (asked of workers)

  How frequently do you do the task?

  Response Format:

  (Number) times per (time unit in terms of hour, day, week, month, or year).

  Reference: Fruchter, Morin, & Archer, 1963.

- Frequency of Task Performance (asked of workers)

  How often do you perform this task on your job?

  Response Scale and Values:

Daily.	$\sqrt{250}$
Weekly.	$\sqrt{50}$
Monthly.	$\sqrt{12}$
Quarterly.	$\sqrt{4}$
Less than quarterly.	$\sqrt{1}$

  (response value calculated as the square root of the annual frequency of performance)

  Reference: Chamberlain, 1964.

- Desired Frequency of Performance (asked of immediate supervisors)

  From your experience as a supervisor, judge about *how often* a typical worker in your operation should perform each of the activities you checked (in Question 2). Base this judgment not only on what you feel would be the most desirable frequency of performance, but also on what it is reasonable to expect any one worker to do.

  Response Scale and Abbreviated Questionnaire Symbols:

  0+ Normally should never perform the activity, but *might* do so in a special or unusual situation.

Y- Should perform the activity, but much less often than once a year.

1Y Should perform the activity about once a YEAR on the average (but not as often as once a month).

1M Should perform the activity about once a MONTH on the average (but not as often as once a week).

1W Should perform the activity about once a WEEK on the average (but not as often as once a day).

1D Should perform the activity about once a DAY on the average.

D+ Should perform the activity several times each work day.

Reference: Ammerman & Pratzner, 1974.
This corresponds to Question 11 for which the computer program of Volume 5 calculates summary values.

- Frequency of Performance (asked of training instructors)

  How often is each task performed during the performance of the job?

  Response Scale:

  Very rarely.
  Once in awhile.
  Frequently.
  Everyday occurrence.

  Reference: Mager & Beach, 1967.

- Last Time Task Was Performed (asked of workers)

  When was the last time you performed this task?

  Response Scale:

  a. Within the past 3 months.
  b. 3 months to a year ago.
  c. More than a year ago.
  d. Never while at this job position.

  Reference: Fruchter, Morin, & Archer, 1963.

PERTAINING TO HOW IMPORTANT IS EACH TASK

- Importance of Task (asked of workers)

  How important is each task to your job?

Response Scale:

1. Extremely unimportant.
2. Very unimportant.
3. Unimportant.
4. About medium importance.
5. Important.
6. Very important.
7. Extremely important.

Reference: Morsh & Archer, 1967.

- Task Importance to Job (asked of workers)

  What *degree of importance* would you assign to each job activity you perform (as checked in Question 1)? Judge the importance of each activity in regard to its contribution to effective operations in your office or firm.

  Response Scale and Definitions:

High Importance	– an *essential* part of your job, in that its performance by you *decisively* influences the effectiveness of your office or firm's operations.
Moderate Importance	– an *important* (but not essential) part of your job. That is, your performance of the activity *materially* (but not decisively) influences the effectiveness of your office or firm's operations.
Low Importance	– a *relatively unimportant* part of your job, in that its performance by you does not materially influence the effectiveness of your office or firm's operations.

  Reference: Ammerman & Pratzner, 1974.
  This corresponds to Question 12 for which the computer program of Volume 5 calculates summary values.

- Task Importance to Job (asked of supervisors)

  Based upon your supervisory experience in your present operations, what *degree of importance* would you assign to each job activity that is appropriate for your . . . workers (as checked in Question 2)? Judge the importance of each activity in regard to its contribution to effective operations in your office or firm.

  In making these judgments of activity importance, assume that *no* helper is temporarily assigned to assist your . . . (workers). Activities of persons in related jobs may be important to your total operation, but only the performance by . . . (workers) should be rated here.

  Response Scale and Definitions:

High Importance — an *essential* part of the workers' job, in that its performance by the . . . (workers) *decisively* influences the effectiveness of your office or firm's operations.

Moderate Importance — an *important* (but not essential) part of the job. That is, its performance by the . . . (workers) *materially* (but not decisively) influences the effectiveness of your office or firm's operations.

Low Importance — a *relatively unimportant* part of the job, in that its performance by the . . . (workers) does not *materially* influence the effectiveness of your office or firm's operations.

Reference: Ammerman & Pratzner, 1974.
This corresponds to Question 13 for which the computer program of Volume 5 calculates summary values.

- Criticality to Job Performance (asked of workers)

  In relation to the other tasks of your present job, how critical is this task to your job performance?

  Response Scale:

  1. Least critical.
  2. Below average.
  3. Average.
  4. Above average.
  5. Most critical.

  Reference: Chamberlain, 1964.

PERTAINING TO PERFORMANCE TIME

- Time Needed to Perform (asked of workers)

  How much time does it usually take to perform the task once?

  Response Format:

  (number) (time unit in seconds, minutes, or hours).

  Reference: Fruchter, Morin, & Archer, 1963.

Additional questions yielding possible indices of the training need for relevant tasks are cited in the Appendix to Volume 4. They pertain to issues of difficulty of task performance, experience requirements, estimates of training requirements, and difficulty of the learning.

REFERENCE SOURCES FOR TASK-RELEVANCY QUESTIONS

Ammerman, H. L., & Pratzner, F. C. *Occupational survey report on Business Data Programmers: Task data from workers and supervisors indicating job relevance and training criticalness* (R&D Series No. 108). Columbus: The Ohio State University, The Center for Vocational Education, December 1974.

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Mager, R. F., & Beach, K. M., Jr. *Developing vocational instruction.* Palo Alto, CA: Fearon, 1967.

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RELATED PUBLICATIONS AVAILABLE FROM THE CENTER FOR VOCATIONAL EDUCATION

OTHER METHODOLOGIES FOR DERIVING CURRICULUM CONTENT

Related Center publications augmenting the procedures and guidelines of the five-volume *Performance Content for Job Training* are:

The initial adaptation of U.S. Air Force occupational survey procedures for application in civilian contexts. This version provides a useful introduction to the methodology of task inventory surveys.

Procedures for Constructing and Using Task Inventories (R&D Series No. 91), March 1973.

Complementing the focus on the task performance content of jobs is the methodology for surveying work-related technical concepts which have practical use to workers in the effective performance of their job. Concept inventory procedures are described and a descriptive report of job significance ratings is given for concepts in the occupations of automotive mechanics, business data programmers, and general secretaries.

Rating the Job Significance of Technical Concepts: An Application to Three Occupations (R&D Series No. 105), December 1974.

Exploratory ways of identifying that work-relevant affect by which workers in an occupation approach their job, their coworkers, and the entire work environment. Procedures are suggested, and initial tryout results are reported, for a promising approach to the identification of those non-technical aspects of the job which contribute to worker satisfaction and success. A companion report is provided for processing the associated worker data.

A Methodology to Assess the Content and Structure of Affective and Descriptive Meanings Associated with the Work Environment (R&D Series No. 98), December 1974.

RCMAT: A Computer Program to Calculate a Measure of Associative Verbal Relatedness (Occasional Paper No. 6), 1975.

OCCUPATIONAL SURVEY REPORTS

Providing field data for establishing the methodology of the five volume *Performance Content for Job Training* are:

Three reports of task surveys conducted for specific occupations. These 1974 surveys were obtained from numerous communities in eight states distributed across the nation. Both workers and immediate supervisors, 200 per occupation, provided task data on an array of experimental questions pertaining to (a) task occurrence, (b) frequency of task performance, (c) task significance to the job, (d) time on job before task qualification is expected, (e) task importance to the job, (f) suggestions of performance problem areas, and (g) primary learning locations for each task.

Occupational Survey Report on Business Data Programmers: Task Data from Workers and Supervisors Indicating Job Relevance and Training Criticalness (R&D Series No. 108), December 1974.

Occupational Survey Report on General Secretaries: Task Data from Workers and Supervisors Indicating Job Relevance and Training Criticalness (R&D Series No. 109), January 1975.

Occupational Survey Report on Automotive Mechanics: Task Data from Workers and Supervisors Indicating Job Relevance and Training Criticalness (R&D Series No. 110), January 1975.

A 1971 survey of workers in one metropolitan area was conducted for entire occupational areas incorporating several specific occupations. Field data were obtained on (a) task occurrence and (b) relative proportion of time spent on each task. The survey reports include comparisons between related occupations, and generate the initial listing of tasks used in subsequent studies of specific occupations within each occupational field.

Automotive Mechanics Occupational Performance Survey (R&D Series No. 86), March 1973.

Secretarial Science Occupational Performance Survey (R&D Series No. 87), March 1973.

Business Data Processing Occupational Performance Survey (R&D Series No. 88), March 1973.

SURVEY OF CURRICULUM DEVELOPERS

Providing information on the activities and needs of curriculum developers is the 1974 survey of more than 300 persons in education and training, both public and private, throughout the nation. The survey analysis emphasizes the responses of curriculum developers concerned with vocational education to the list of 68 work activities, but includes other areas of public education, business/industry, and government agencies. Responses were given to activity questions pertaining to (a) occurrence of the activity, (b) degree of problem encountered in performing each activity, and (c) activity importance to the job.

Activities, Problems, and Needs of Curriculum Developers: A National Survey (R&D Series No. 115), May 1976.

TASK INVENTORY EXCHANGE

To promote the sharing and general availability of task inventories and of occupational surveys, a central clearinghouse is conducted for the collection and dissemination of materials prepared by agencies in education, labor, agriculture, industry, business, government, the professions, and various special interest groups. Three volumes of a directory of over 800 available task inventories so far have been published. Additionally, a symposium on methodologies was sponsored at which 15 presentations were made to an audience of 158 persons from 26 states, sharing their experiences, problems, solutions, and thinking on various aspects of the issue.

Directory of Task Inventories. Volume 1, 1974 (UN Series No. 6), January 1975.

Directory of Task Inventories. Volume 2, 1975 (UN Series No. 7), 1975.

Directory of Task Inventories. Volume 3, 1976 (UN Series No. 8), 1976.

Proceedings of a Symposium on Task Analyses/Task Inventories (UN Series No. 10), November 1975.